ELECTRICAL REVIEW 29 AUGUST 1958

TECHNOLOGY DEPT.

FIRST 1000 MW POWER STATION

ELECTRICAL REVIEW

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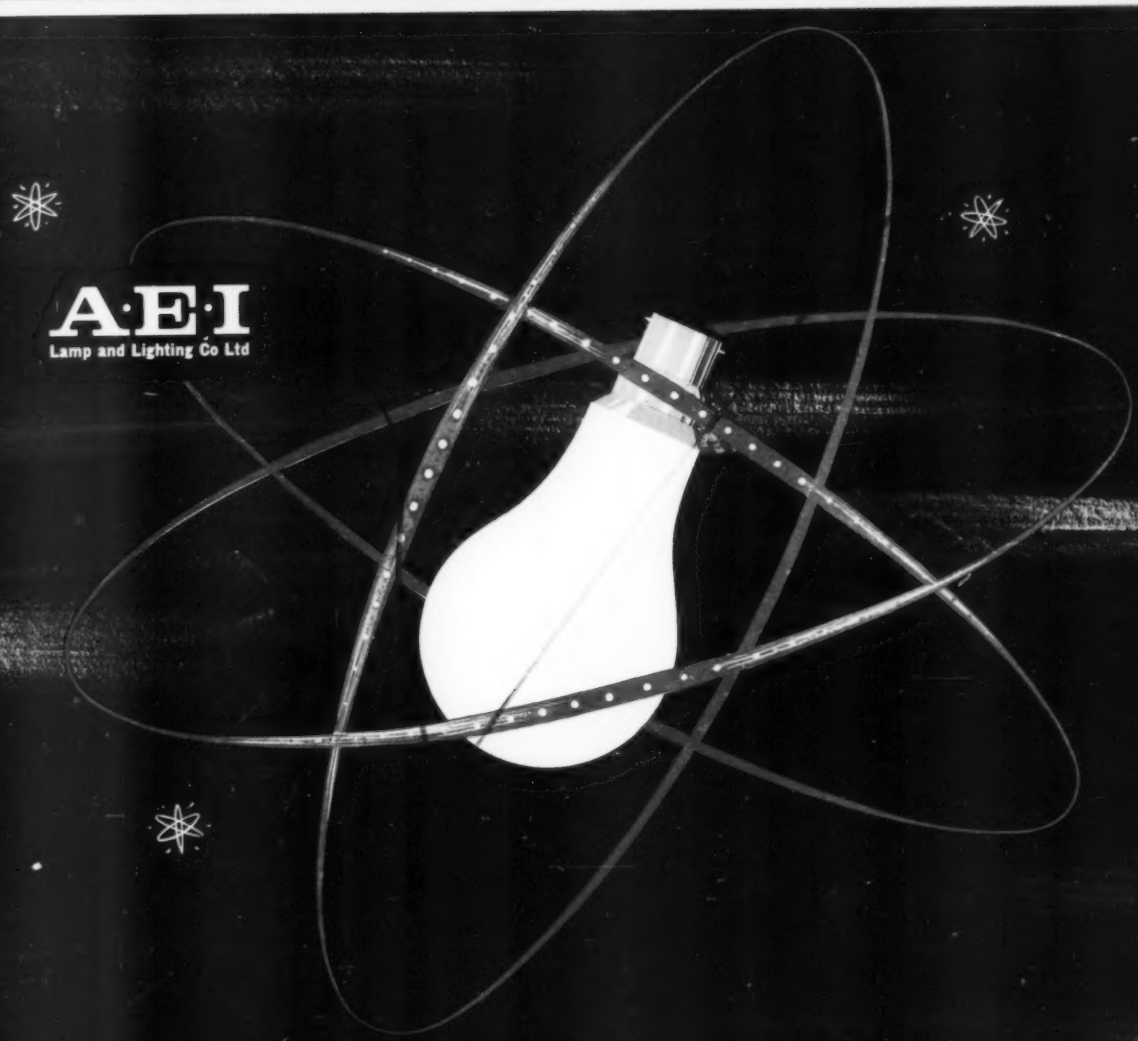

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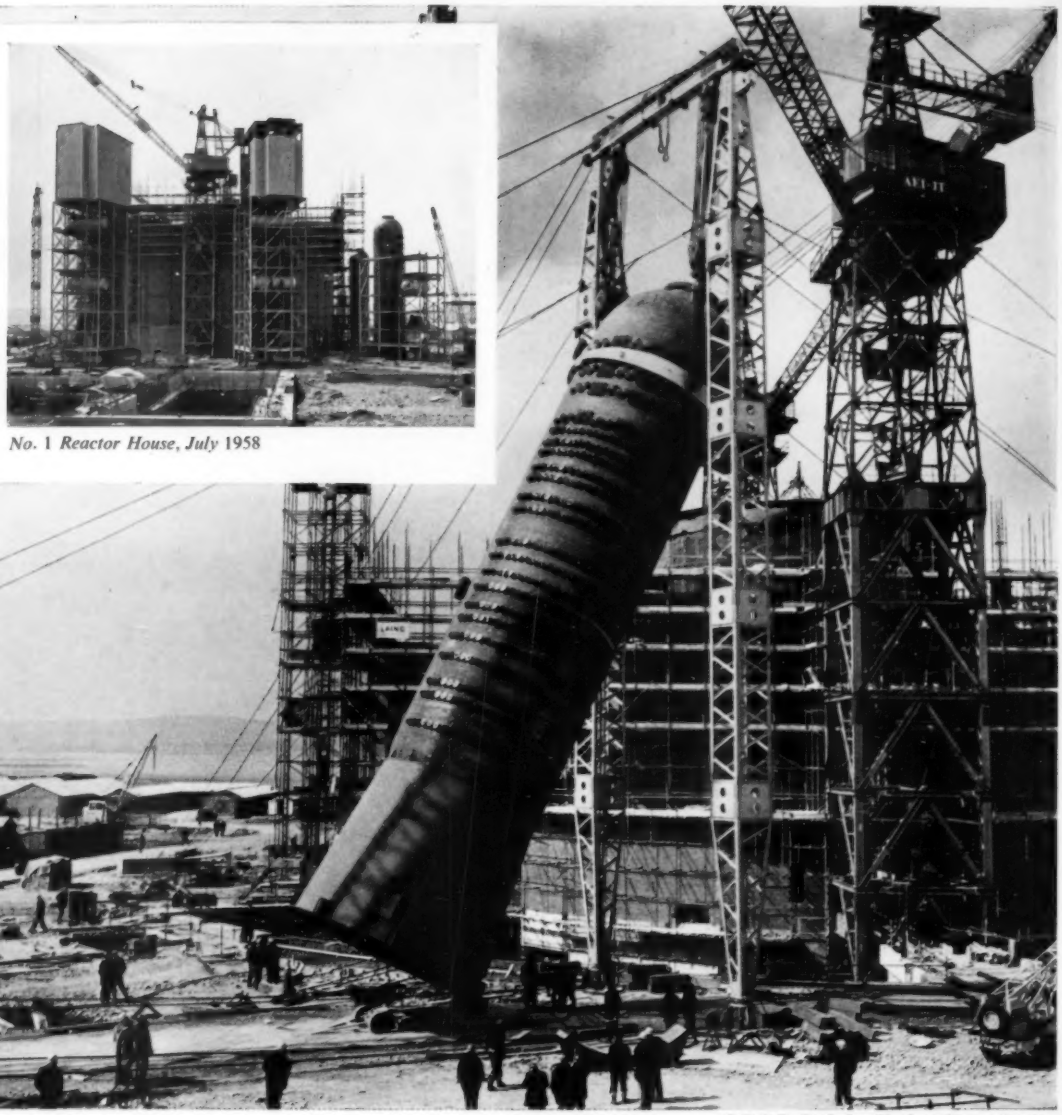

No. 1 Reactor House, July 1958

C.E.G.B. Berkeley Nuclear Power Station, being built by A.E.I.-John Thompson Nuclear Energy Company Ltd.

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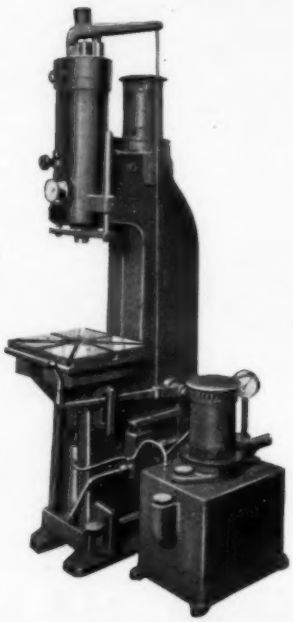

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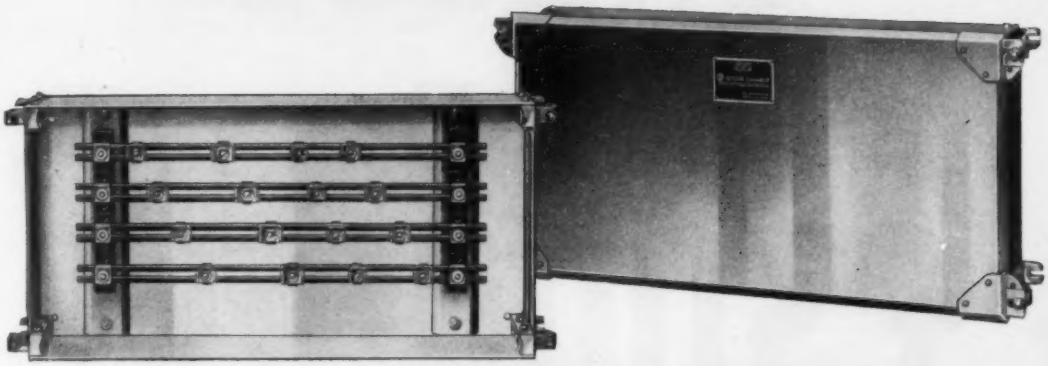

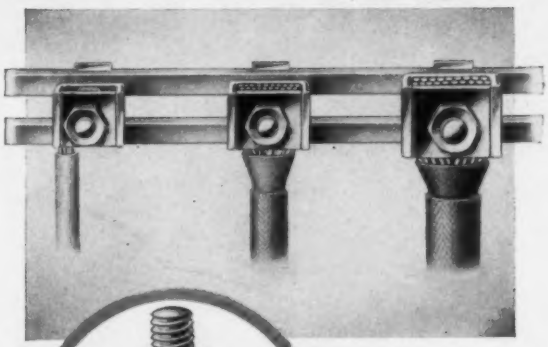

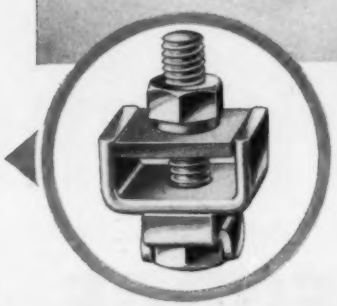

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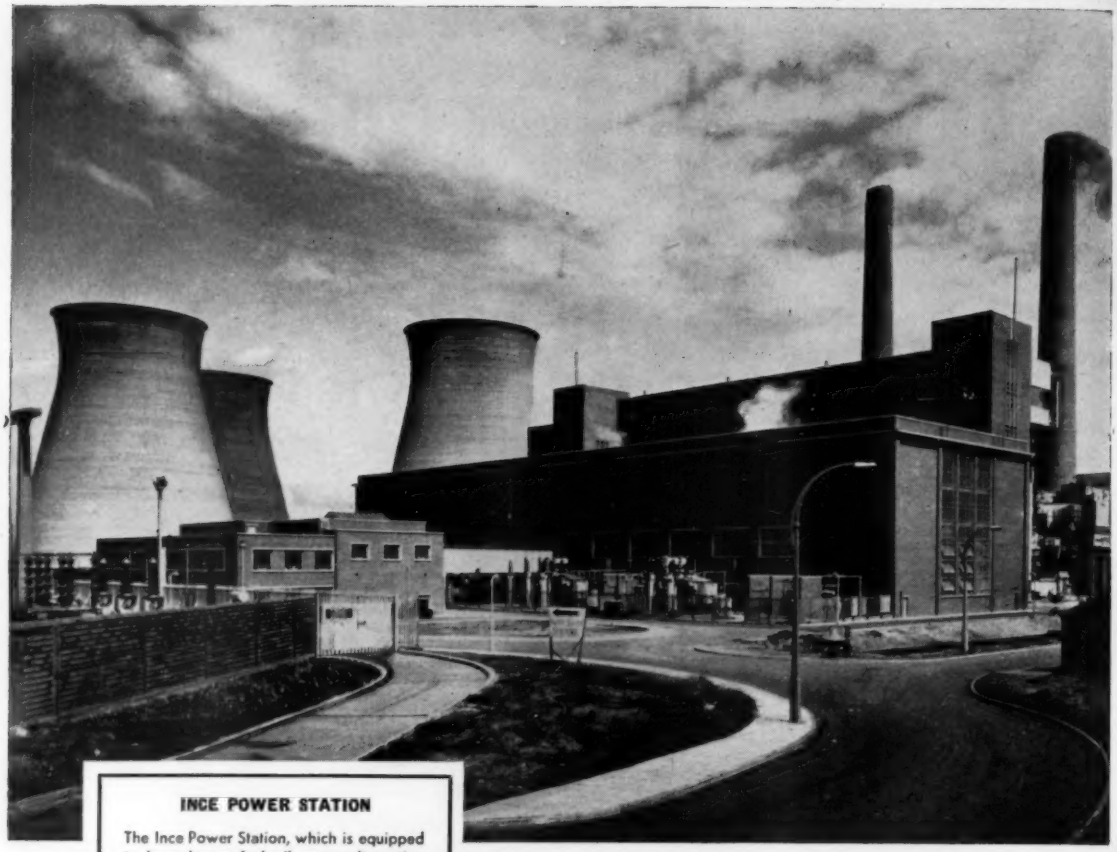

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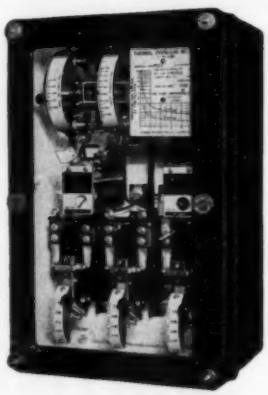

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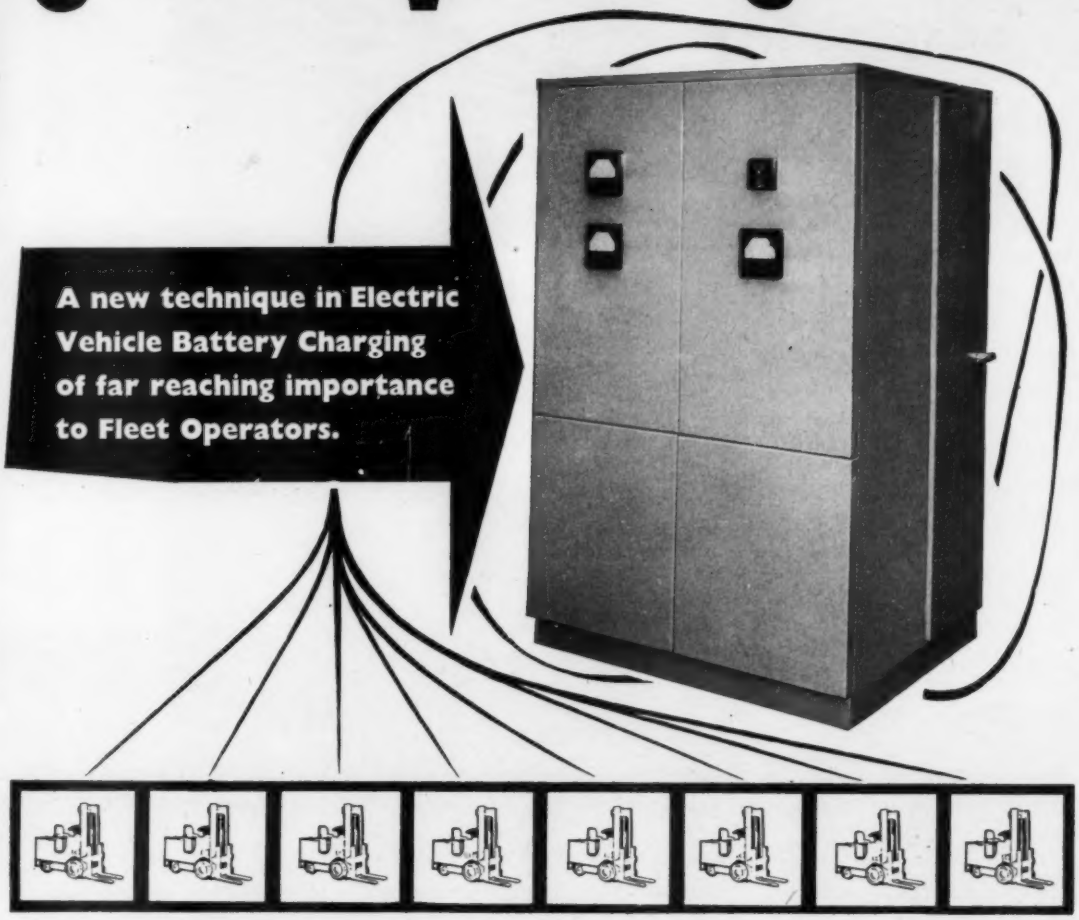

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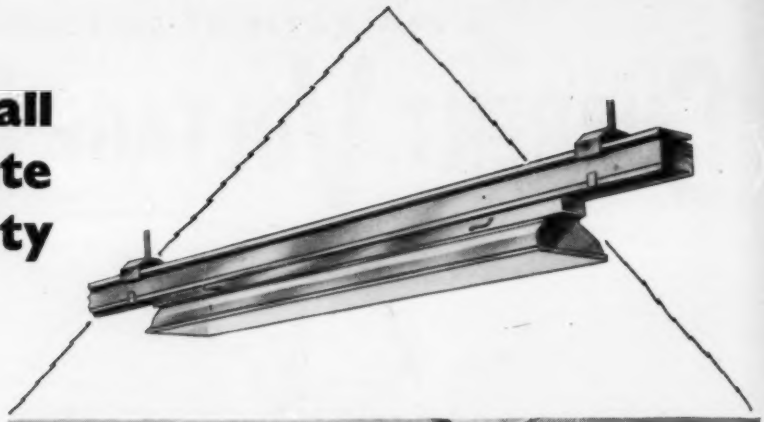

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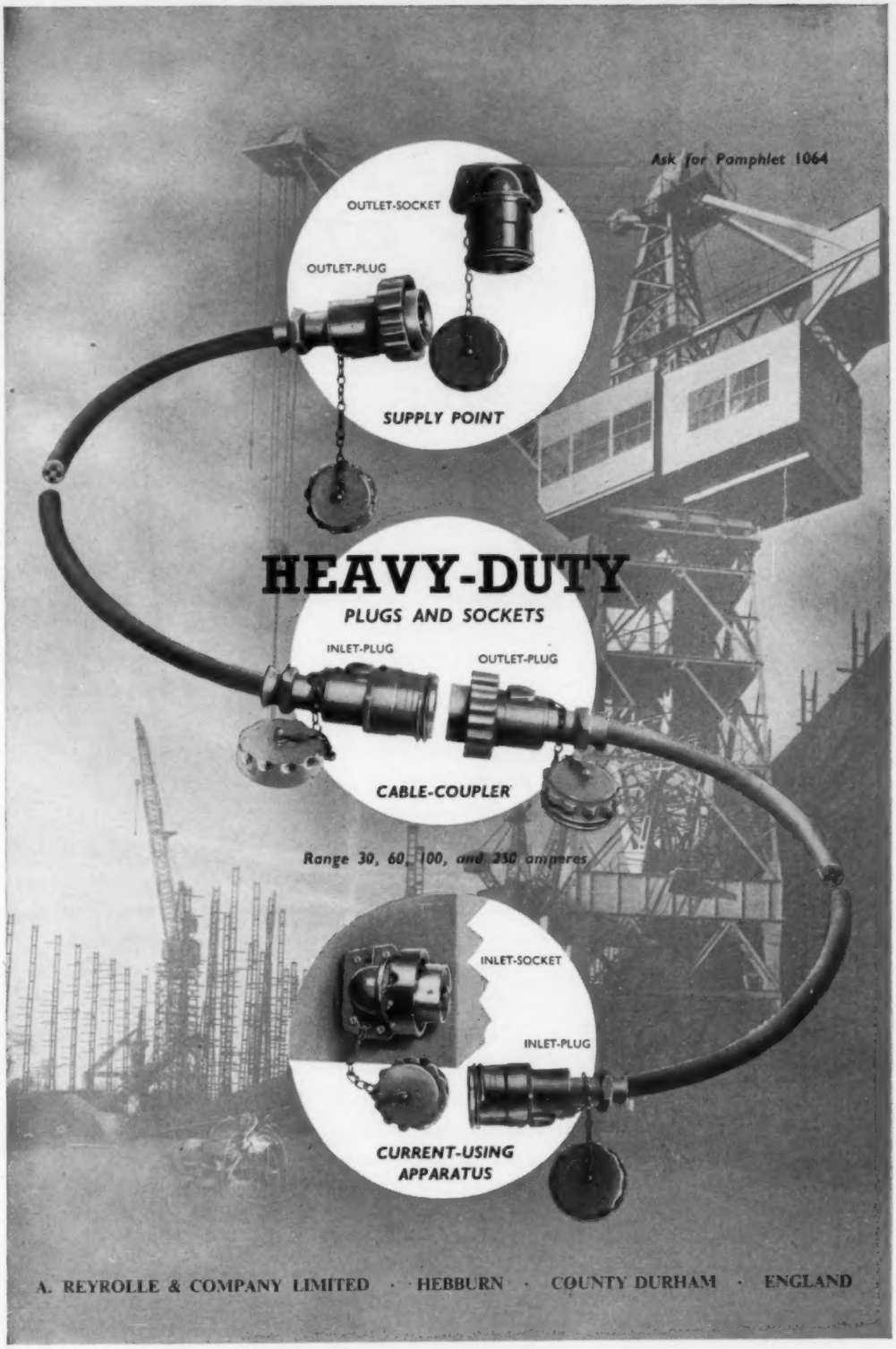
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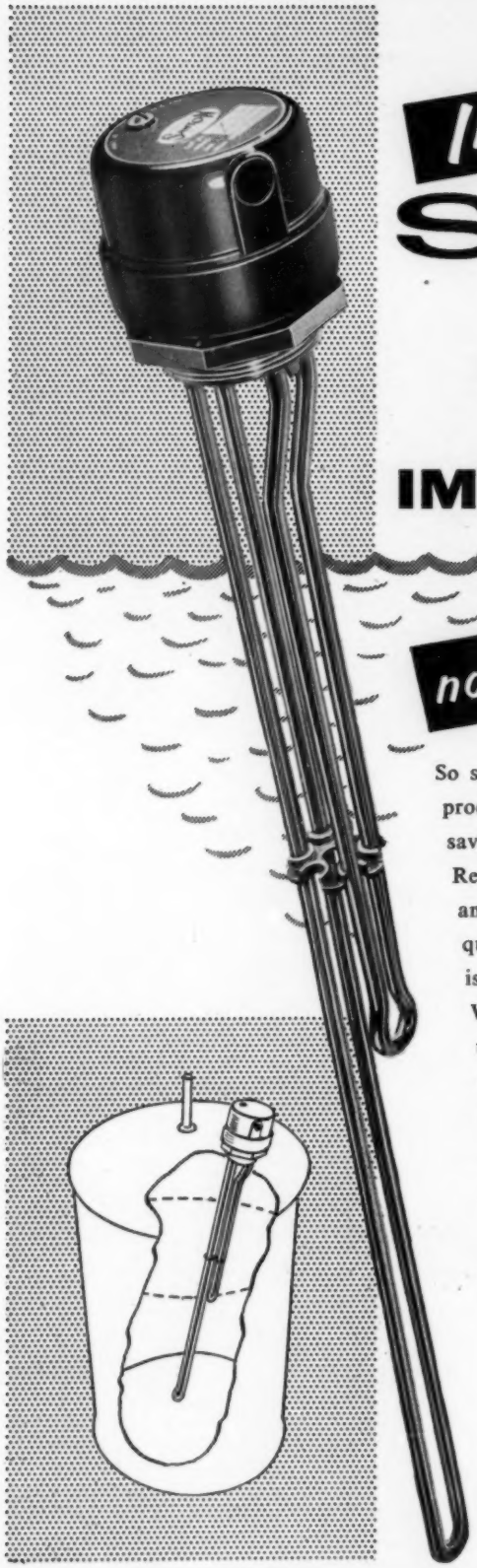

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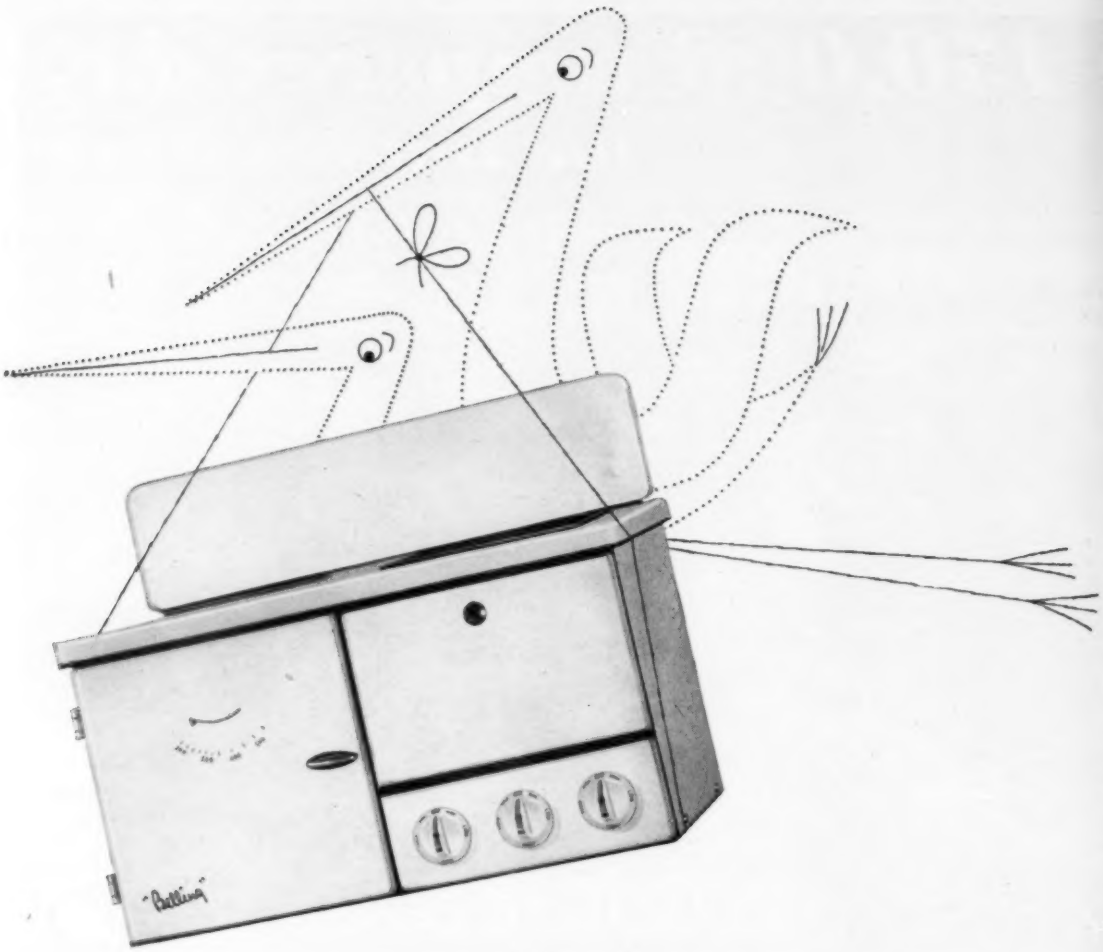

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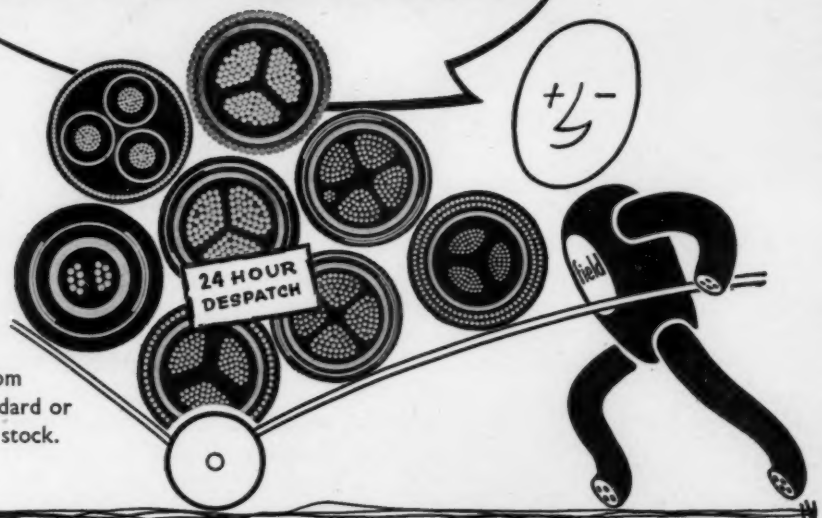

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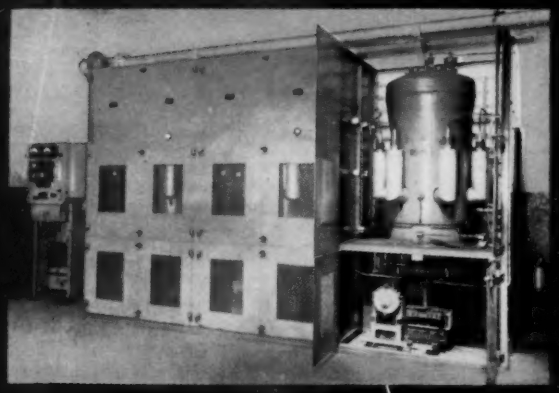

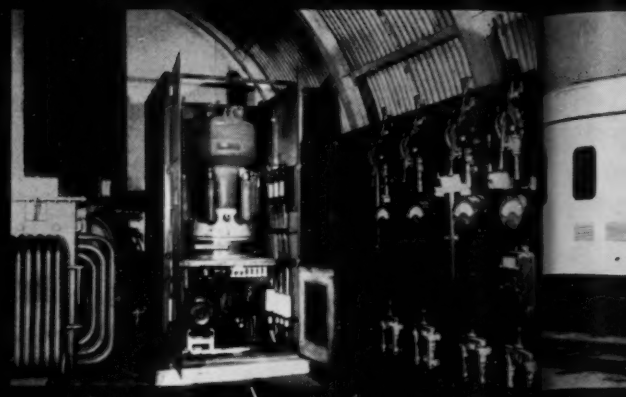

600 kW, 230/240 V, 3-cylinder pumpless air-cooled steel tank rectifier installation at a British steelworks.

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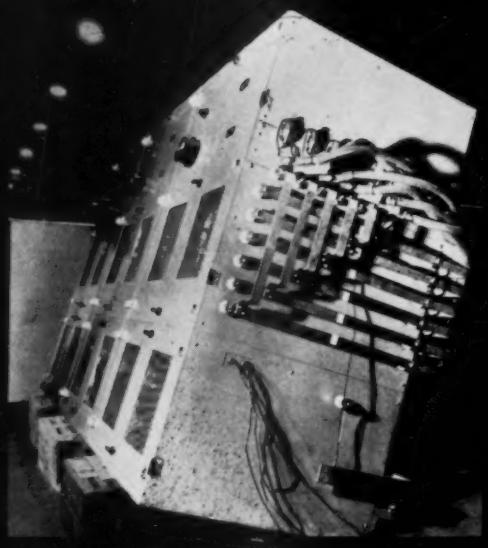
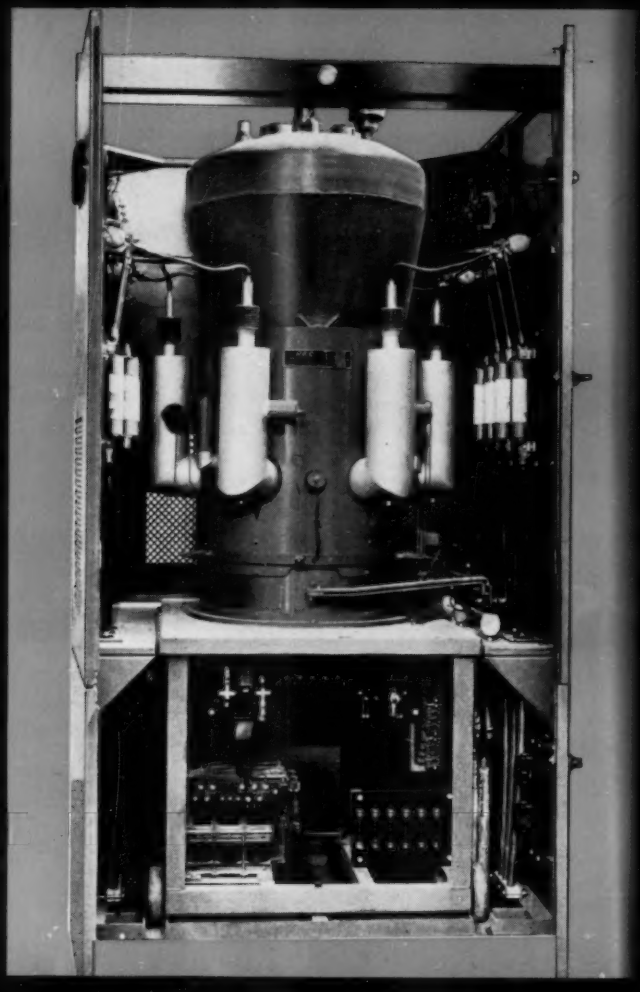
300 kW at 530 V rectifier in Western Australia. The first of its kind installed underground (300 ft. below) in Australasia.





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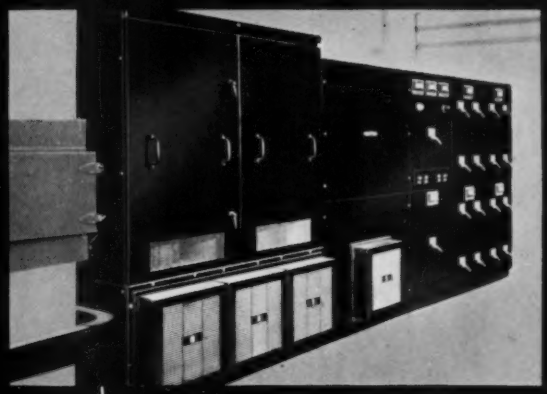

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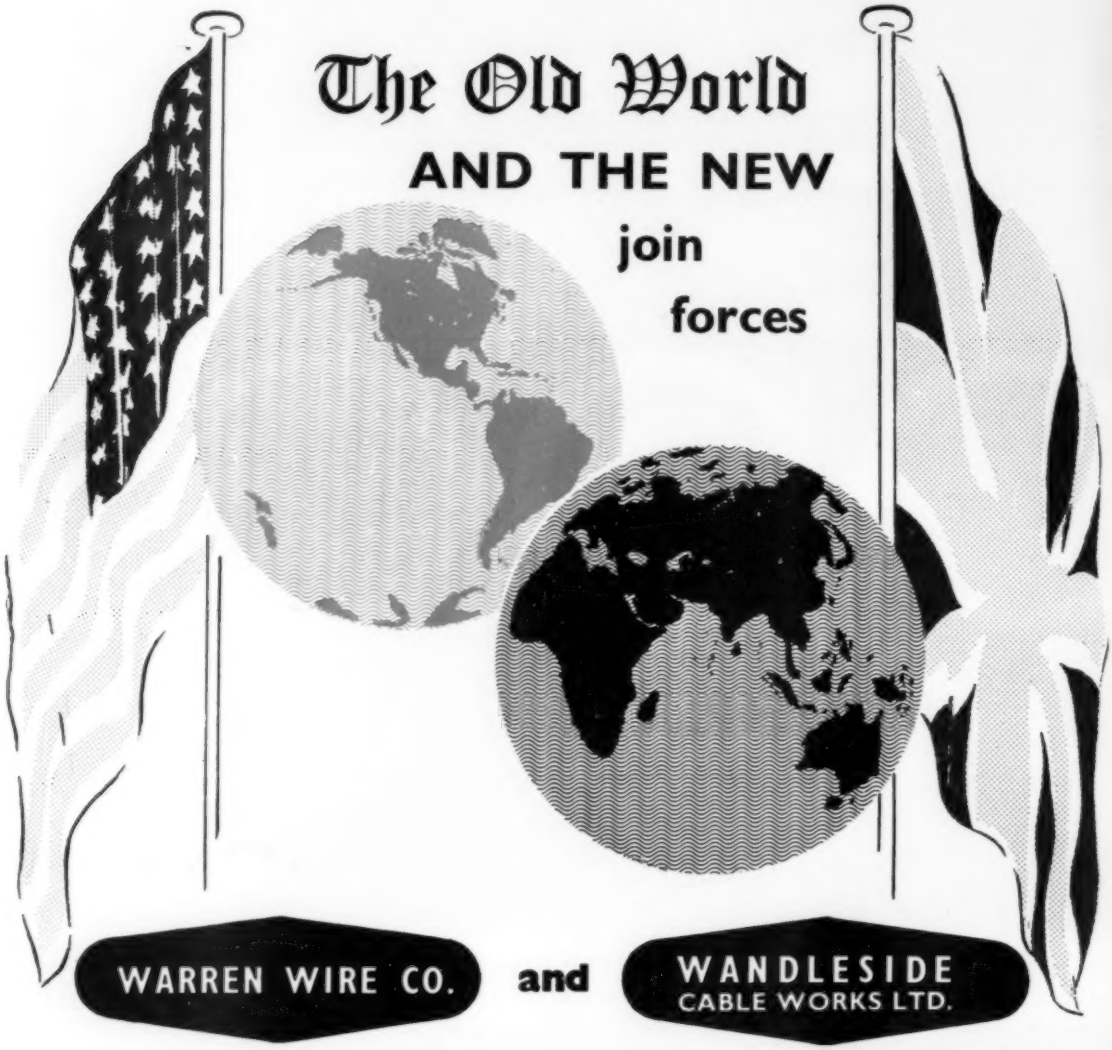

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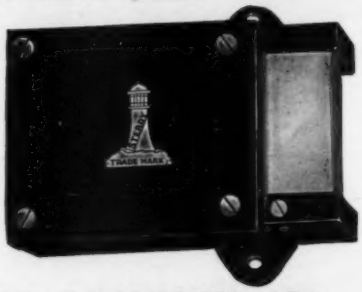

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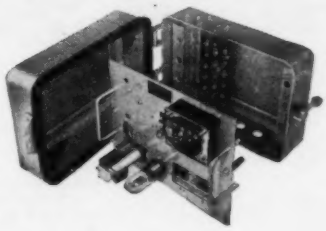

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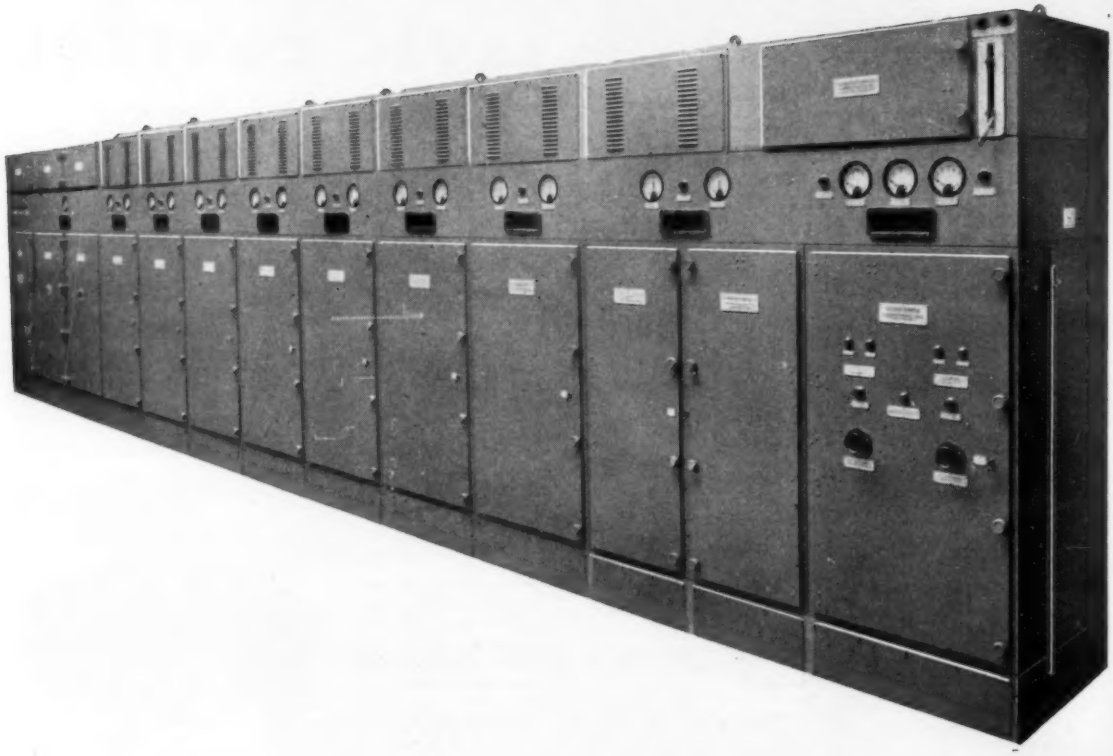

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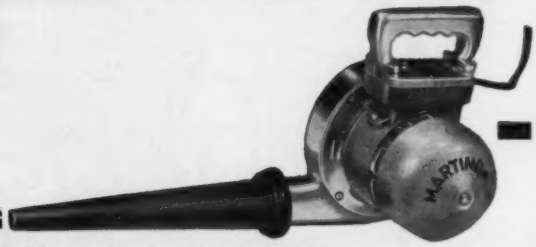
The NEW MARTINDALE Portable BLOWERS



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The powerful Martindale Blowers direct a stream of dust-removing air into every inaccessible crevice of electrical and other machinery, thus removing a common cause of short circuits and motor failures.

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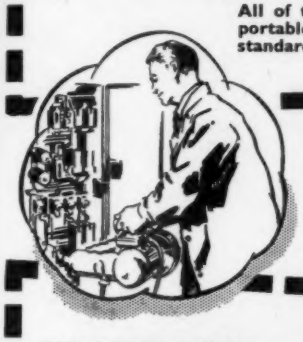
All of the five blowers are instantly converted into portable industrial suction cleaners by the use of standard attachments at little cost.



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The "Port-A-Vac" (regd.) light-weight harness permits the Martindale Blower to be used as a powerful vacuum cleaner carried in comfort upon the operator's back leaving him free to climb ladders, etc., to clean out-of-reach parts of the factory.

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With this amazing equipment any Martindale Blower is converted into a suction cleaner which picks up both *liquids* and *solids*, the liquids and dirt being deposited into the special tank and only the airborne dust into the filter bag.

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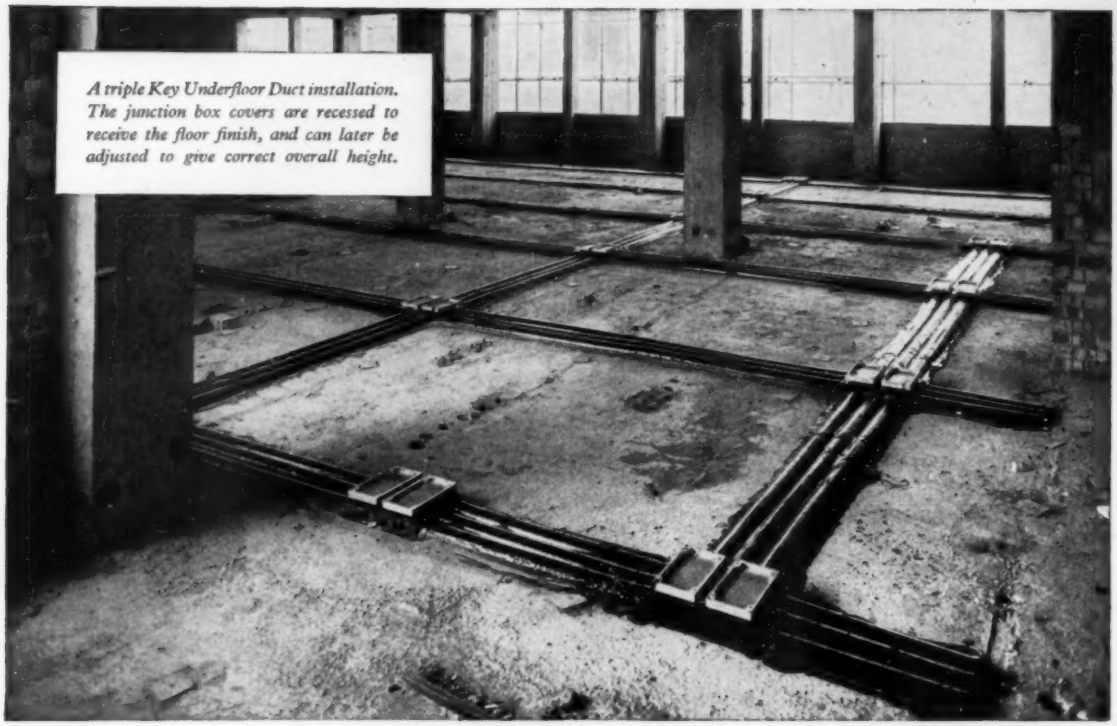
Key Underfloor Duct
solves wiring problems economically



A triple Key Underfloor Duct installation. The junction box covers are recessed to receive the floor finish, and can later be adjusted to give correct overall height.

Electric power and telephone outlets can be installed and added as necessary when Key Fibre Underfloor Duct is used. On a materials plus labour basis the cost of installations is lower than any metal system. Because of their light weight and ease of cutting and fitting, Key ducts can be quickly laid. Since there is no necessity to pre-position outlets, the architect can install an underfloor duct scheme, and later fit outlets to suit the occupant's requirements. The fitting of these outlets is a quick and simple matter and the most complete range of fittings is available for lighting and telephone systems.

easy to lay—low cost
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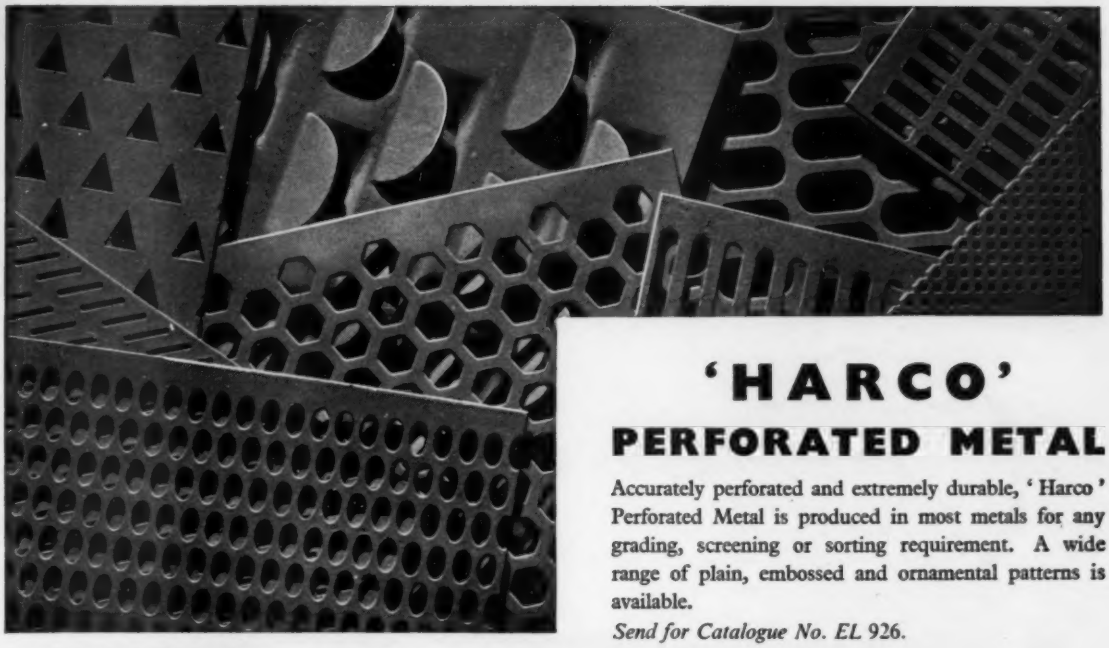

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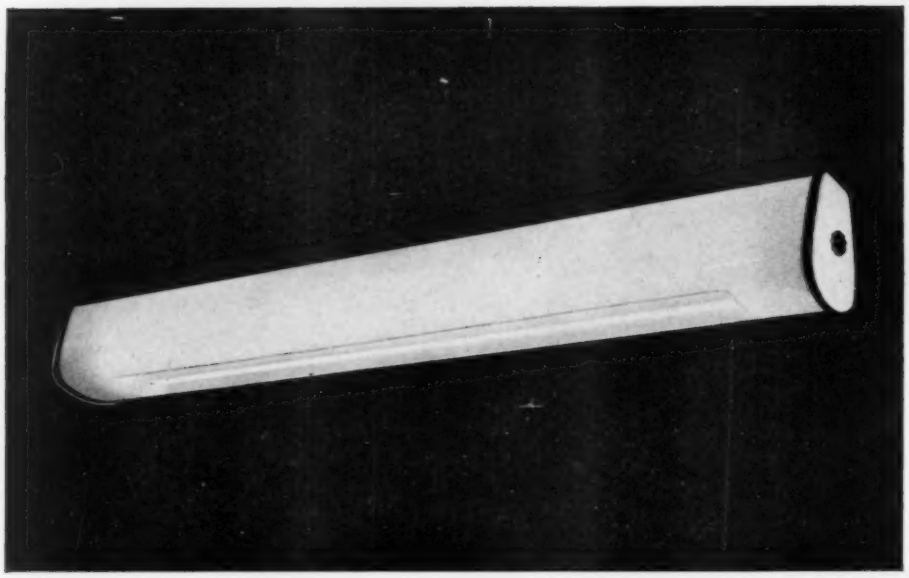

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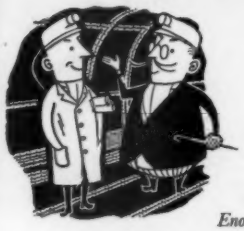

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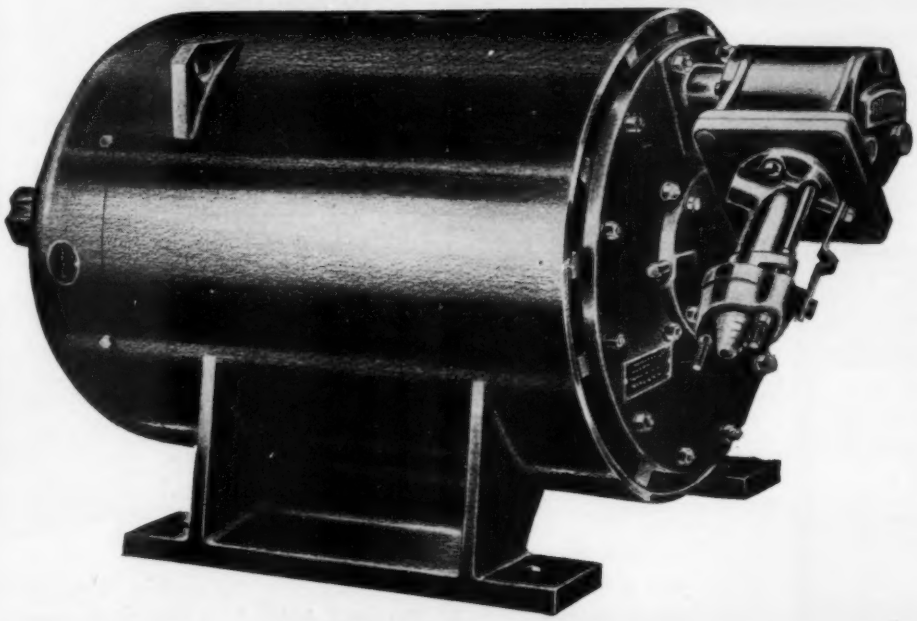

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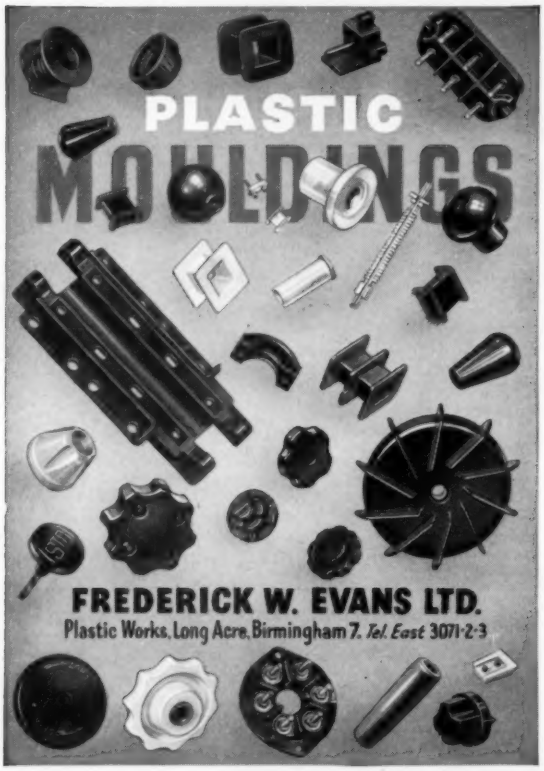

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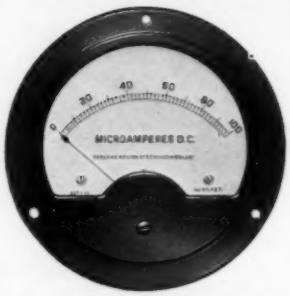

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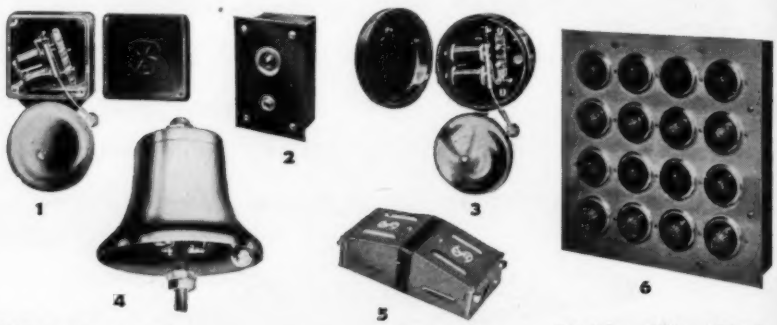

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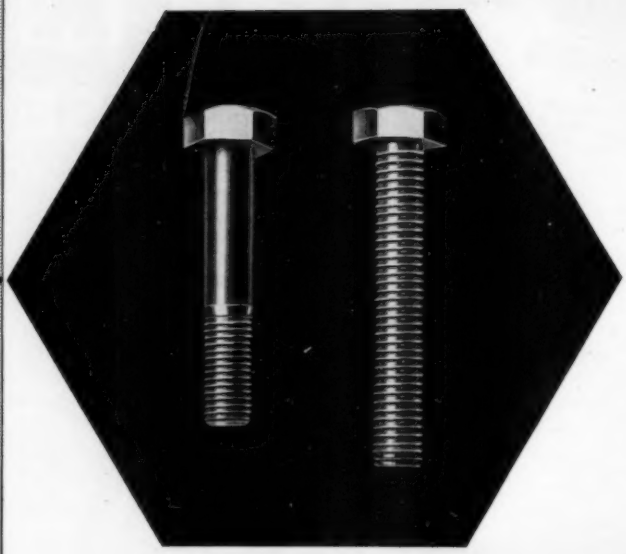

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Won't rot or corrode.
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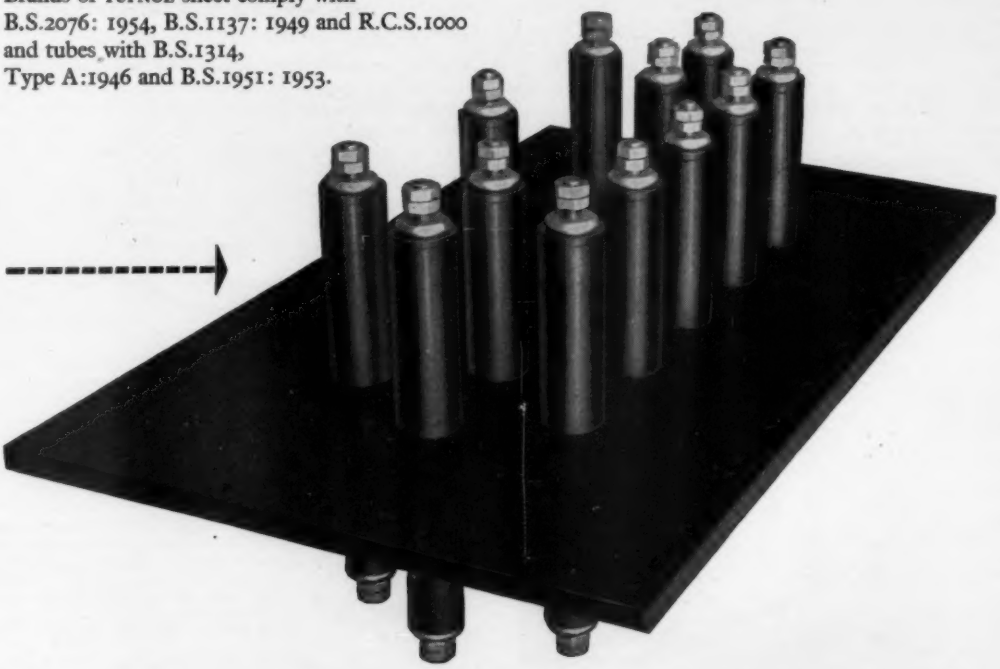
Terminal boards or any other TUFNOL components can be made to your specification in our workshops; or TUFNOL can be supplied in sheets, tubes or rods and other sections for you to machine yourself.
Write for further information.



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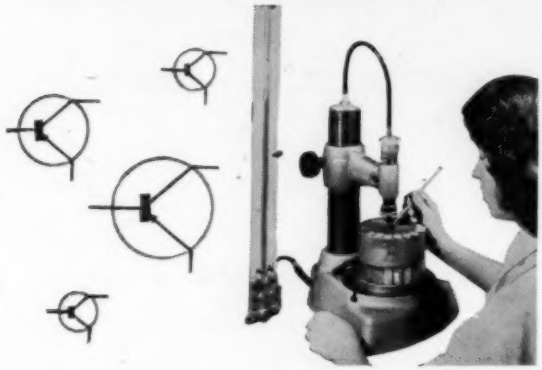
creating the right atmosphere No. 2



transistor manufacture

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Above: Grading germanium wafers prior to assembling into transistors

Below: Drying germanium wafers in vacuum ovens

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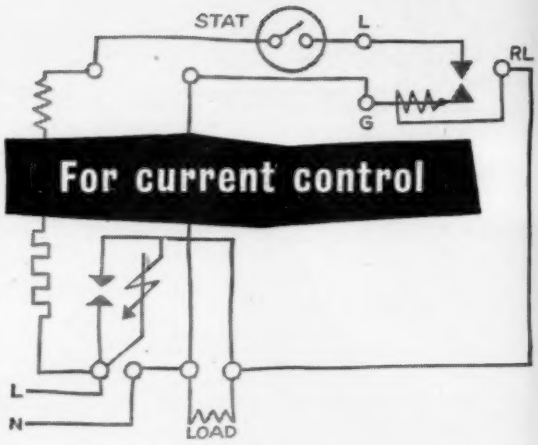

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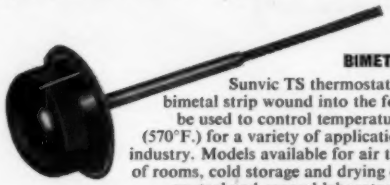
Sunvic components are widely used for controlling equipment such as moulding presses, furnaces, incubators, chemical plant, etc. Together with the Sunvic potentiometric recorder they also have numerous applications in scientific and industrial research particularly for measuring, controlling and recording temperature and small electrical quantities.

If you have a specific problem or would like technical information on any or all Sunvic components, please contact Sunvic Controls Ltd., P.O. Box 1, Harlow, Essex. Tel: Harlow 25271.



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Sunvic TS thermostats are operated by a bimetal strip wound into the form of a helix. Can be used to control temperatures of up to 300°C. (570°F.) for a variety of applications in research and industry. Models available for air temperature control of rooms, cold storage and drying chambers, for oven control and general laboratory work, and with a sensitivity of ±1/10°C. for very accurate control.

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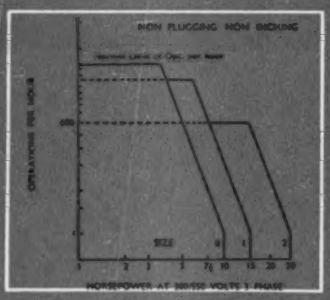

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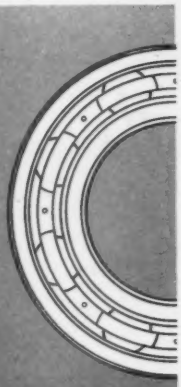

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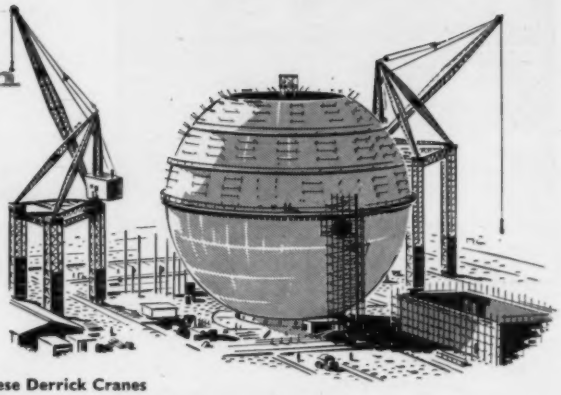

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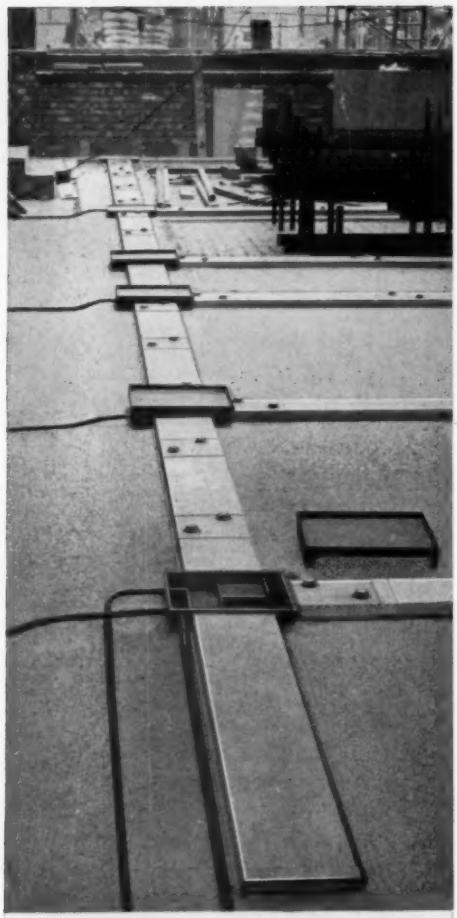

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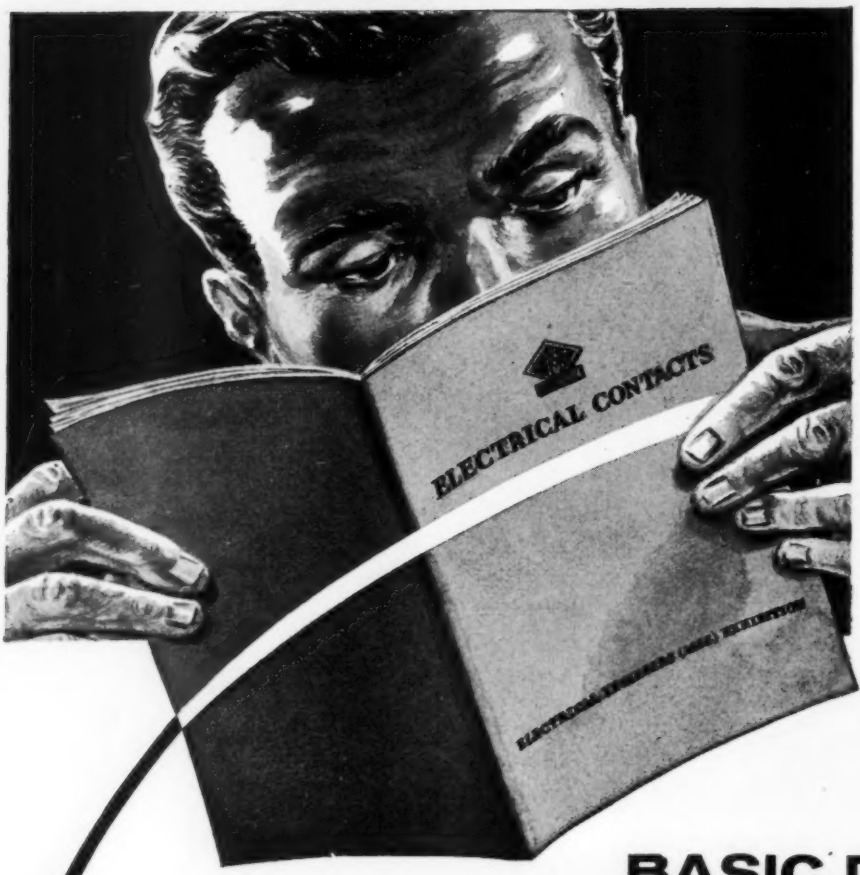

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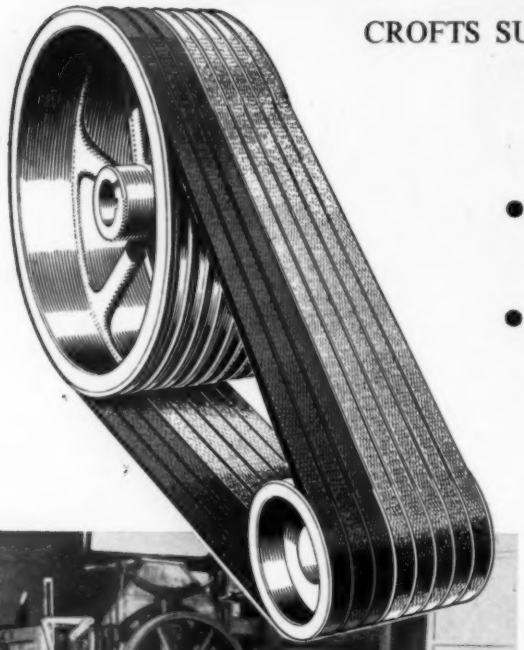

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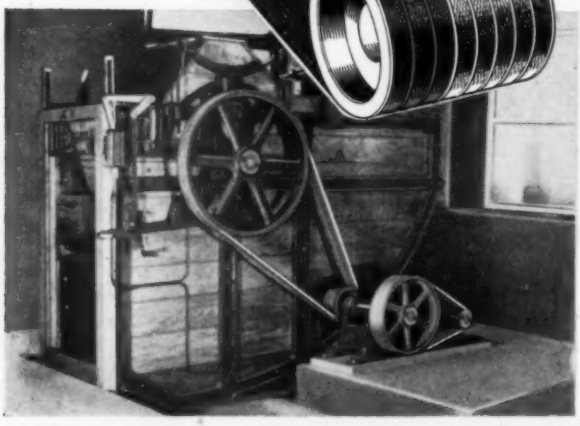

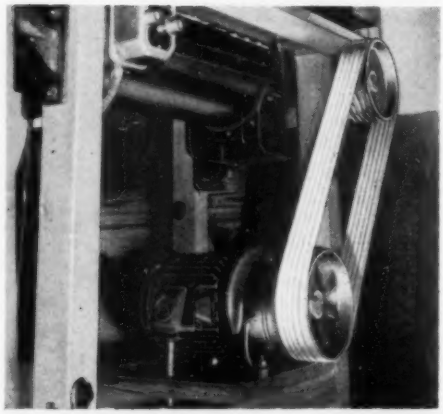

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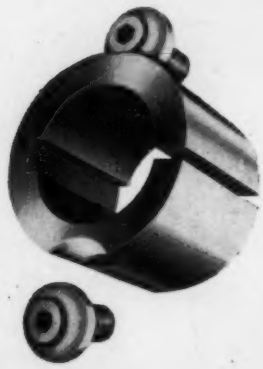

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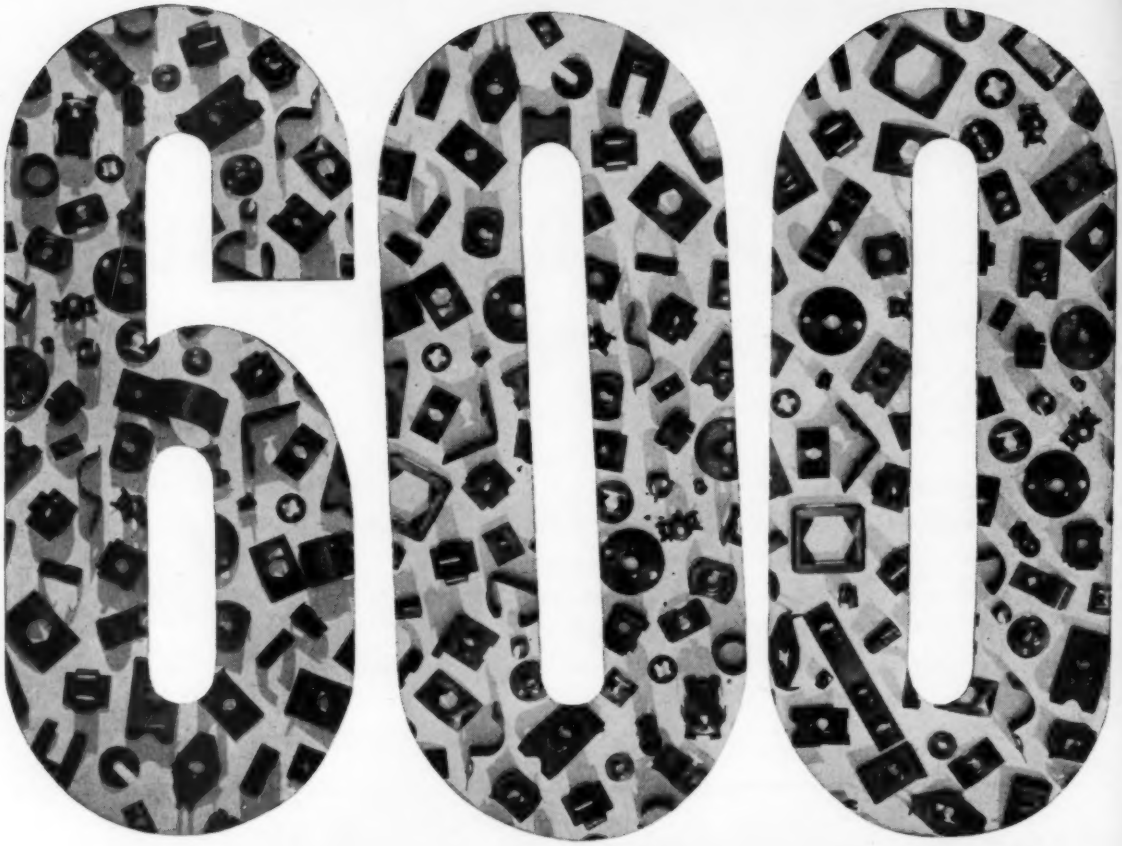

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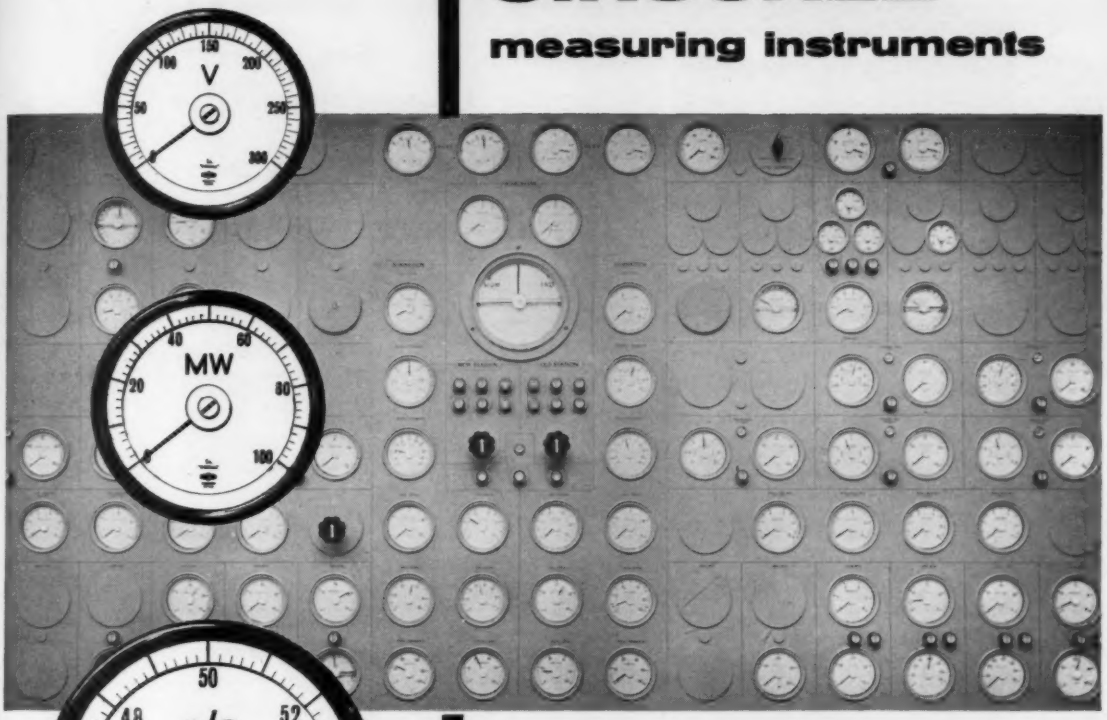

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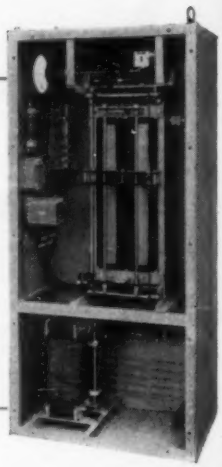

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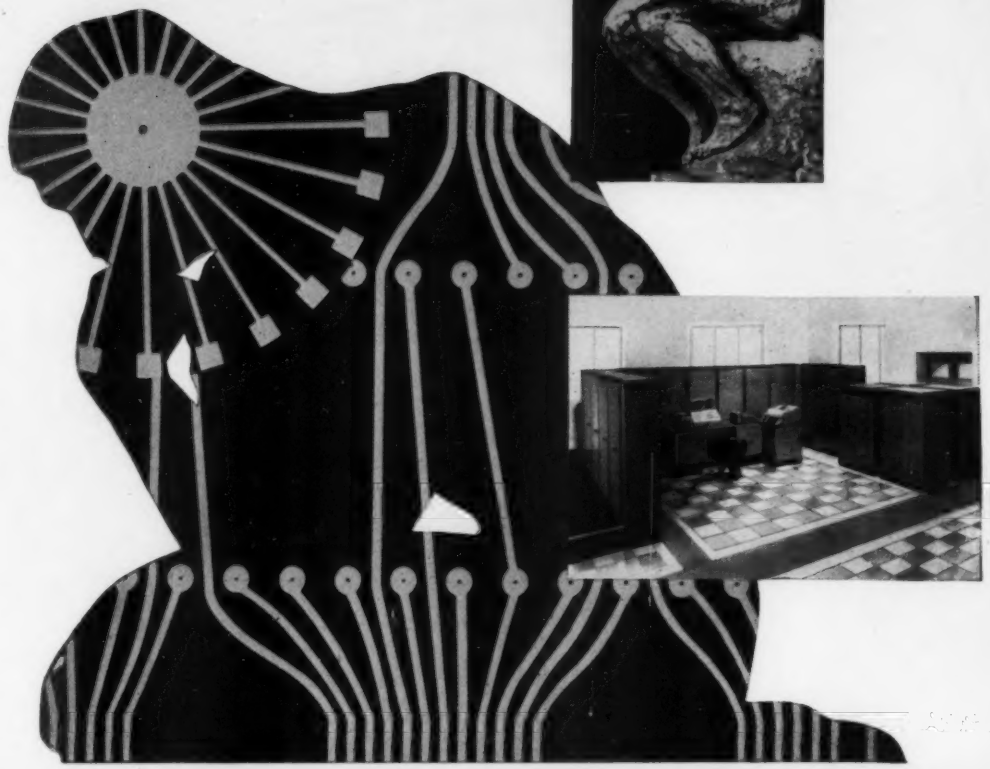

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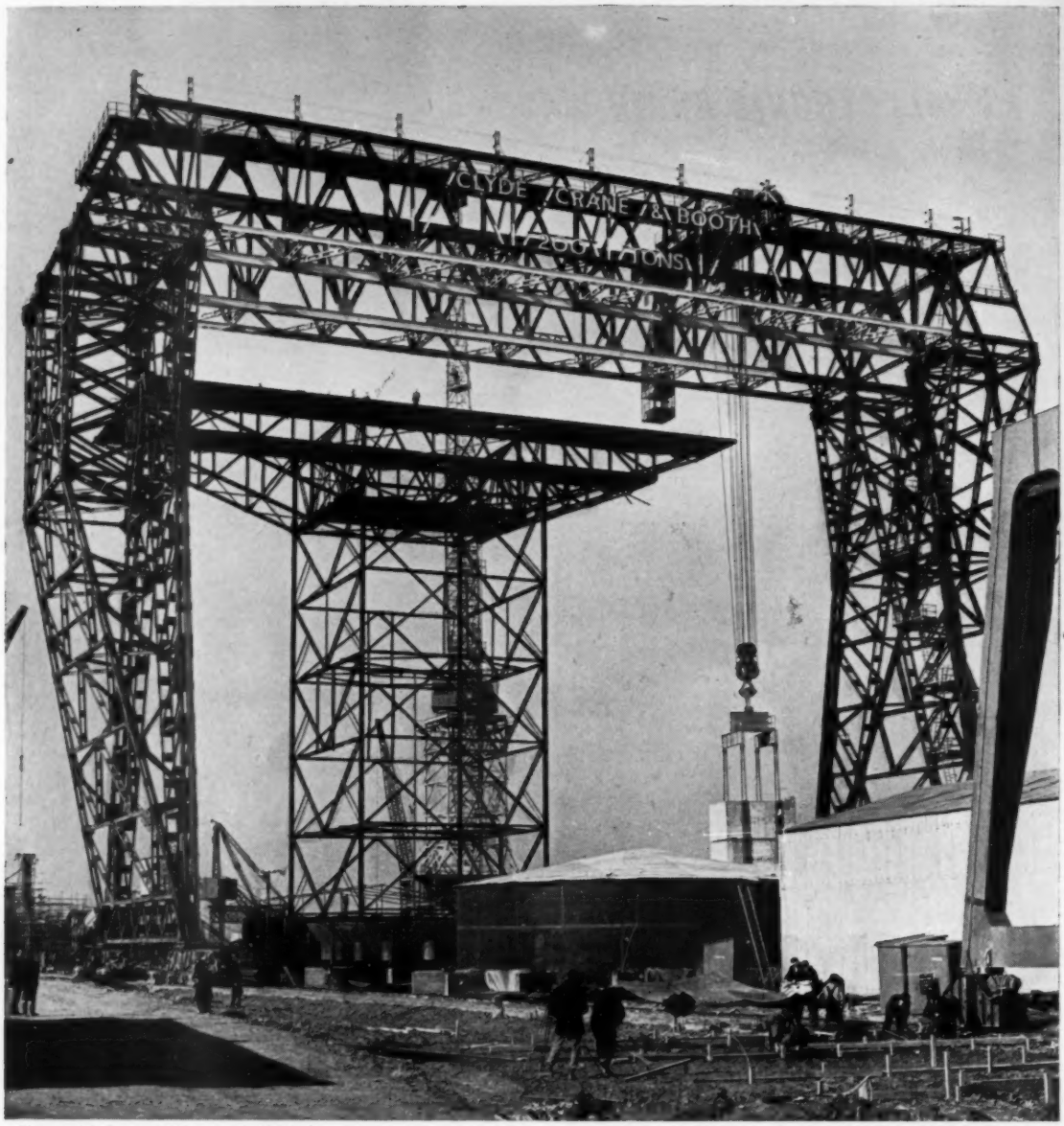

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Colossus astride Bradwell

THIS GOLIATH heavy duty crane soars astride the site of the Nuclear Power station at Bradwell. With a span of 178 ft., a height of 177 ft., and a weight of 800 tons, it is one of the biggest in the world. Lifting 200 tons at a time, and entirely self-contained, this colossus could well save six months in a project vital to Britain's future.

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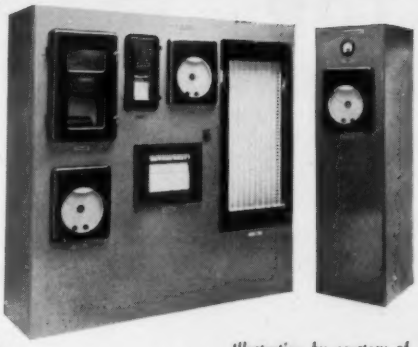

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FRIDAY
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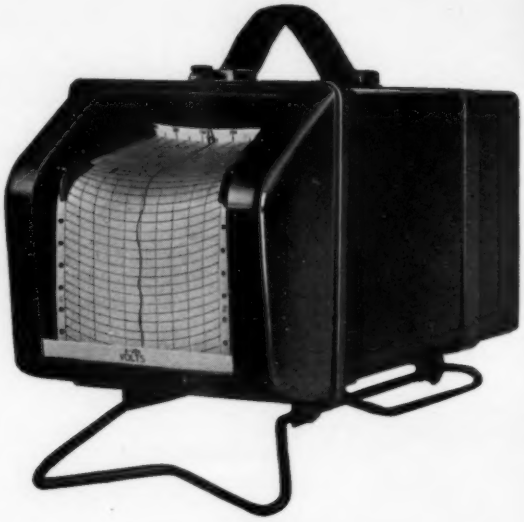
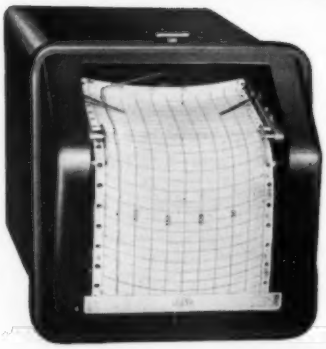


SEMI-FLUSH



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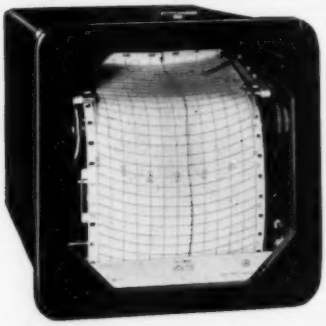

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ELECTRICAL REVIEW

22 August 1958 Vol. 163 No. 8 Established 1872

Power Generation Advance

As we announced last week, we publish in this issue the first of two articles describing High Marnham which will be the highest capacity power station (1,000 MW) in Europe and will have the largest single generating units (200 MW). The special drawings which accompany the description have been produced with the emphasis on the operational aspects. We were encouraged to do this by the success which attended the drawings, prepared by our engineering artist, of the Calder Hall nuclear power station published in the *Electrical Review* of 19th October, 1956, and of the Hunterston nuclear power station of the South of Scotland Electricity Board which appeared in the issue of 26th April, 1957.

The station has the most advanced steam conditions ever employed in this country, namely 2,450 p.s.i. and 1,060 deg F, which are slightly higher than those of the Thorpe Marsh station, of later design and higher capacity, which will have two 550 MW generating units (2,400 p.s.i. and 1,055 deg F), as mentioned in the *Electrical Review* of 21st February last. These advanced steam conditions have been well discussed in this journal and they are truly a great achievement, but perhaps because of their significance by way of the attainment of higher thermal efficiency, there may be a tendency to lose sight of other notable features of the station.

High Marnham—with its 15,200 tons of steelwork in the main building structure; with loads up to 1,500 tons on the boiler house columns; with the 450ft high chimneys each carried by over 260 cast-in-situ piles; and with turbo-alternator foundation blocks each measuring 104ft long, 37ft wide and 35ft high above basement level—represents a great structural feat. But the foregoing are not the only highlights. Already the new structure at High Marnham is a landmark in a wide area around it, and during a visit to the site last month we were told by one of the constructional engineers that the work programme which started in 1956 was up to planning date and there was every expectation that the first 200 MW set would go into commission next year. Considering that much of the earlier work is common to the whole of the 1,000 MW station, this is highly satisfactory and all concerned must be congratulated on the achievement.

There should be commendation for the excellent siting too. It is near the East Midlands coalfields and the Chesterfield to Lincoln railway, and its position on the west bank of the River Trent ensures a good water supply. With these local points may reasonably be considered the excellent scheme for ash disposal by means of a 5¼ mile long multiple pipeline. Special architectural attention has been given to the station and it is already evident that it will be of good appearance without extravagance.

EMBARGO RELAXED

The protracted negotiations on East-West trade have at last resulted in a victory for the British point of view and good sense. It would be pleasant to think that the easing of the restrictions on electrical generating plant, motors and certain instruments will now lead to a marked increase in orders from the Communist countries, but as their trade is in the hands of state monopolies the outcome is uncertain. In fact, although much has been heard about Russian and Chinese "shopping lists," electrical exports from Britain to the Communist bloc dropped again in 1957 (to £3·9 million) and the decline has continued this year. Nevertheless, these countries are valuable potential markets for British electrical manufacturers.

It is still possible that the continuance of an embargo list will be exploited by the Communists for political purposes, and trade may suffer accordingly. Russia's rapid technical and scientific advance has not apparently been affected seriously by the restrictions now ended and it may be that more has been lost by British manufacturers from the frustration of normal business contacts. It is difficult to believe that the present list is really the "bare strategic bones" and that a further reduction cannot be made without endangering defence.

VOLTA RIVER PROPOSAL

Last February Dr. Nkrumah, the Prime Minister of Ghana, said that a "vicious circle" had arisen in connection with the financing of the 600 MW Volta River hydro-electric project. Governments interested in the scheme had stipulated that Ghana should first come to an agreement with the aluminium companies whose participation formed the basis of the development. On the other hand the aluminium companies wanted assurances about the cost of power before they could agree to go into the scheme.

It was then stated that President Eisenhower had offered the "good offices" of his Government in examining the position and that further discussions would be held with Aluminium, Ltd., who held bauxite concessions in the Yenahin area. Now Dr. Nkrumah is reported as having mentioned the possibility of proceeding with the development of the river quite separately from the production of aluminium, in the hope that the aluminium interests would ultimately be persuaded to take advantage of the power available. Apparently the United States Government has undertaken to share the cost of a further survey by the American Kaiser Company.

NUCLEAR POWER IN U.S.

It is commonly believed that the United States is interested in nuclear power development only from the export angle because the country's fuel resources appear to be ample for a very long time yet. A recent report on the subject by the National Planning Association forecasts, however, that between 1975 and 1980 three-quarters of all new power plant in the United States will be nuclear because by that time atomic power will be competitive with other forms.

At the same time the Association cannot agree with those who believe that "fossil" fuels will rapidly become scarcer and therefore more expensive. It says that supplies are plentiful and prices are not likely to be increased by more than 25 per cent in the next quarter of a century. Consequently the cost of nuclear power will have to be drastically cut if it is to become competitive; the Association expects a figure of 5·9 mills/kWh (say ½d) in 1980 by which time nuclear energy will still account for only 10 per cent of the total power output.

TRANSISTORS AND SEMICONDUCTORS

Within ten years of its invention the transistor has become what is perhaps the most significant development in electronics since the invention of the thermionic valve. The past decade has been a period of rapid and spectacular advance, in which new types of transistors, new applications and mass production techniques have been introduced. However, the initial period of startling new developments is now drawing to a close; the transistor has established its position and can cover the more obvious electronic applications. The main requirement now is to consolidate past progress and to introduce these new developments into adjacent fields.

In these circumstances a meeting of experts from all over the world will be invaluable for it will enable the point to which various transistor and semiconductor techniques have advanced to be assessed and provide a basis on which future developments can be foreseen and planned. It is with these thoughts in mind that the Institution of Electrical Engineers is convening an international convention on transistors and associated semiconductor devices to be held in London next May. This convention will be the most comprehensive ever held on the subject and, apart from anything else, will provide delegates from overseas with an opportunity to appreciate the British contribution in this important new field.

CONTROL OF QUALITY

Recently a comprehensive report was published by the Research Committee of the Institution of Production Engineers dealing with the creation and control of quality in industry. The report outlines a refreshingly new conception of the achievement and control of product quality in all phases of manufacturing. It is addressed particularly to directors and managers in industry because it is only they who can bring about the changes necessary to implement the recommendations contained in the report.

The Committee's conception of the control of quality involves much more than a new system of inspection; it requires a new attitude on the factory shop floor. Essentially, the method is based upon the principles of operator control. In other words, the report recommends encouraging or re-creating pride of workmanship by placing the responsibility for quality primarily on the man actually doing the job. This inducement of quality at all stages of the manufacturing process will largely eliminate the need for armies of inspectors. It will spread the responsibility over the whole manufacturing team and thus achieve the planned level of quality at the minimum cost.

HIGH MARNHAM

Electrical Review 22 August 1958

The station buildings from the south-east

ADVANCED COAL-FIRED STATION WITH FIVE 200 MW SETS

As we have emphasised in our leader this week, the erection of the High Marnham power station in the East Midlands Division of the Central Electricity Generating Board represents a great constructional feat. The ultimate station generating capacity will be 1,000 MW, in five 200 MW generating units, each with its self-contained boiler. The first of these units will be put into commission next year, a little more than two years after the commencement of work on the site

ONE of the major projects of the Central Electricity Generating Board is the construction of a new 1,000 MW steam generating station in the operating area of the East Midlands Division. The station is within easy reach of the East Midlands coalfields and is situated on the west bank of the River Trent adjacent to the main railway line connecting Chesterfield and Mansfield with Lincoln.

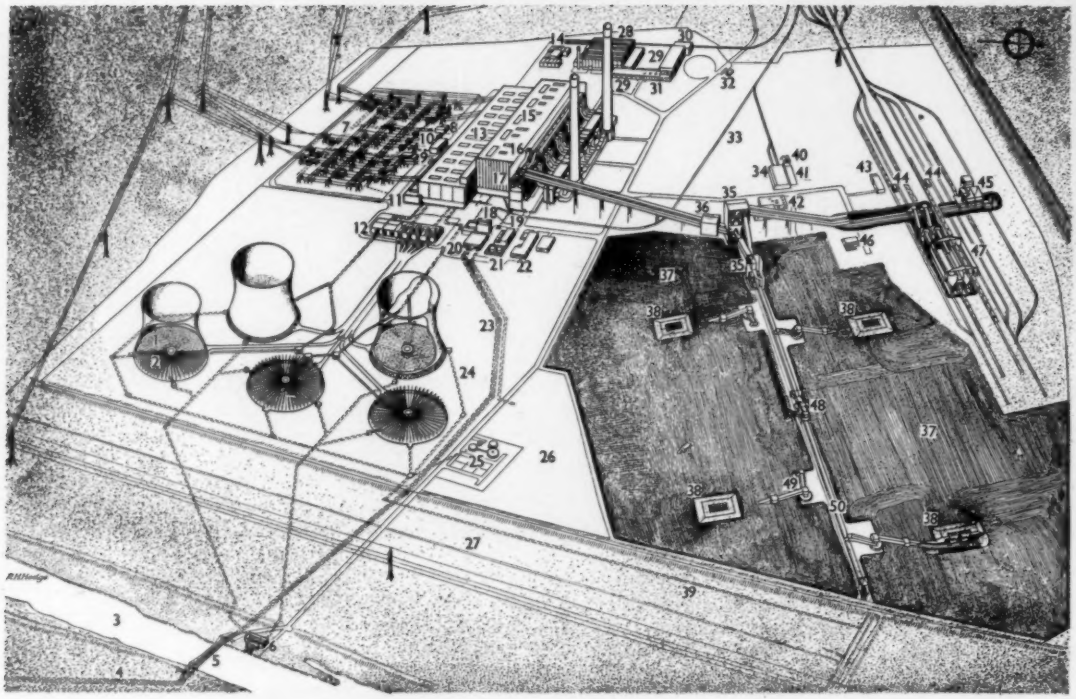
The site is situated roughly at the centre of the triangle formed by Newark, Lincoln and Retford. The area surrounding the site is mainly agricultural and due consideration of this feature has been made in the restriction of the site area, the planning of the site layout and the building construction. The development of the site has involved the building of a construction camp and the provision of water and electricity supplies to the area and has required some improvements to the minor road approaches.

The main building will house five 200 MW generating units arranged longitudinally in an east to west direction giving a southern aspect to the exterior wall of the turbine house. The west gable of the main building is seen from the road approach to the station whilst the view of the east gable from across the River Trent is screened by the five cooling towers which are arranged in double triangle formation.

The coal sidings form the northern boundary of the site and lie parallel with the main railway line. The administration buildings are arranged on the approach road to the main building and comprise offices, canteen and workshops. Two of the predominant features of the main structures of the station are the twin concrete chimneys each 450ft in height and the five 340ft high cooling towers. The latter have been constructed with a khaki coloured cement which gives a pleasing effect when viewed against the general background.

Separate ancillary buildings for circulating water, water treatment, oil fuel and ash plant are situated between the cooling towers and the east gable of the main building. The 275 kV outdoor switch compound is situated south of the main building and in a parallel formation to the line of the generating units. The pump house for extraction of make-up water for the circulating system is on the west bank of the River Trent and a road viaduct has been constructed to maintain access over the washland when the river is in flood. The existing flood-bank has been increased in height to ensure that the power station area shall be adequately protected from flooding under the worst known conditions of tide and elements.

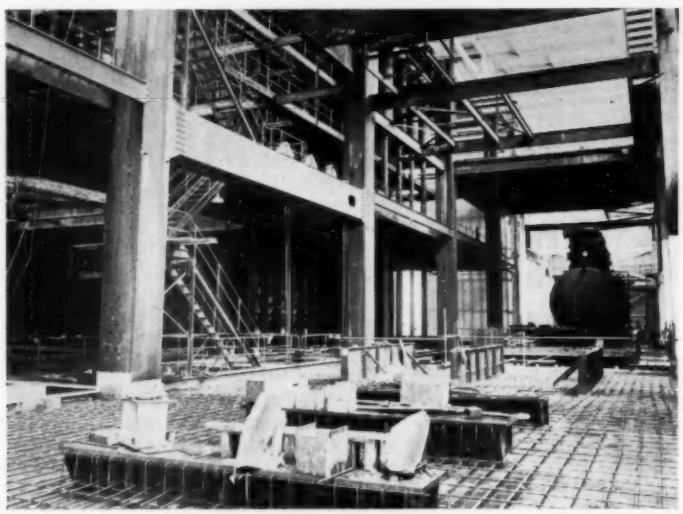
To ensure that the site drainage will be maintained during river flood conditions a drainage pump house has been constructed within the station boundary. A further feature of the river works has been the construction of a 276ft span suspension bridge to carry the dust pumping lines across the River Trent. Advantage has been taken of this feature to provide a walkway over the river to facilitate the journey of station staff who may live in the villages on the east bank of the river. Disposal of ash



The arrangement of the High Marnham Generating Station: 1. Eliminator pack; 2. Water distribution pipes; 3. River Trent; 4. Dust pipes to gravel pits; 5. Foot and pipe bridge; 6. Make-up pump house; 7. 275 kV switch compound; 8. Switch compound oil plant; 9. Relay building; 10. Chlorination plant; 11. Station control room; 12. Circulating water pump house; 13. Turbine house; 14. Garage, oil and paint stores; 15. Boiler house; 16. Bunker conveyor; 17. Conveyor junction tower; 18. Dust hopper; 19. Substation; 20. Ash plant pump house; 21. Oil plant; 22. Water treatment plant; 23. Dust pipes; 24. Purge pipe; 25. Sewage purification plant; 26. Emergency ash lagoon; 27. Drainage channel; 28. Workshops and stores; 29. Offices; 30. Laboratory; 31. Canteen; 32. Gate house and road weighbridge; 33. Railway line to turbine house; 34. Locomotive shed; 35. Junction tower; 36. Weigher house; 37. Coal stockpile; 38. Reclaiming ground hoppers; 39. Purge pipe; 40. Fuel tanks; 41. Bulldozer shed; 42. Coal plant control; 43. Coal sidings substation; 44. Railway weighbridges; 45. Tippler; 46. Surface water pump house; 47. Track hoppers; 48. Travelling tripper; 49. Conveyor lifted during stocking out; 50. Reversible conveyor

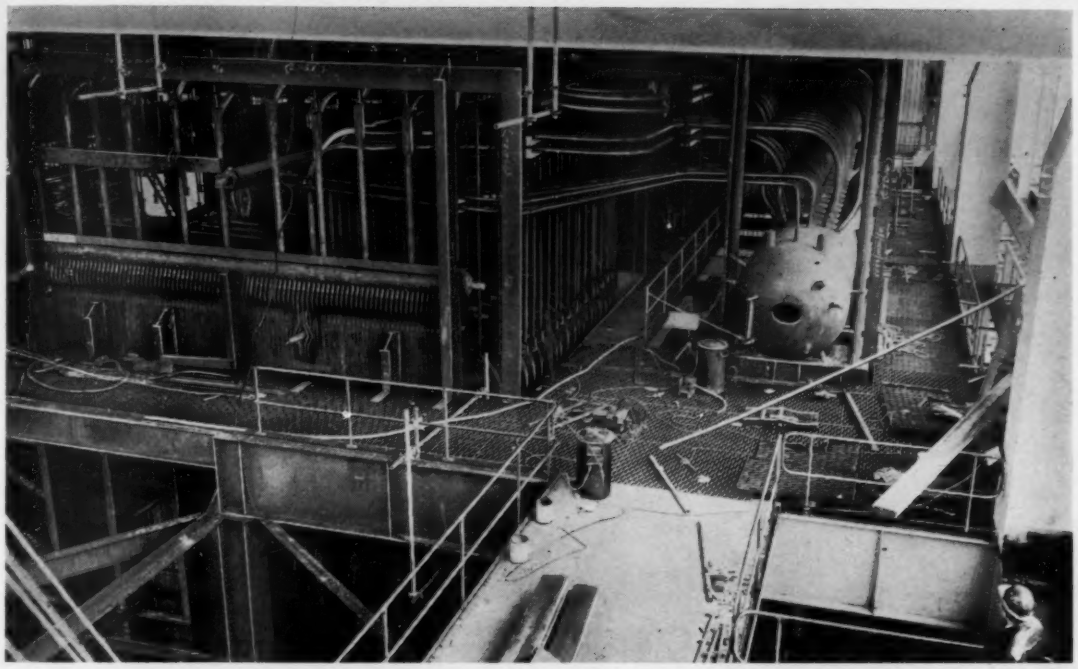
from the station will be by pipeline in the case of pulverised fuel dust and fine furnace ash, and by road transport for coarse furnace bottom ash.

The preliminary civil engineering work including construction of roads, camp and ancillary services, was commenced in February, 1956, and it is expected that the station will start feeding into the national 275 kV grid system in June next year. Construction of the buildings and erection of main plant are now well under way. Indeed the outline of the structure has already become one of the features of the broad flat landscape of this area of Nottinghamshire and Lincolnshire.



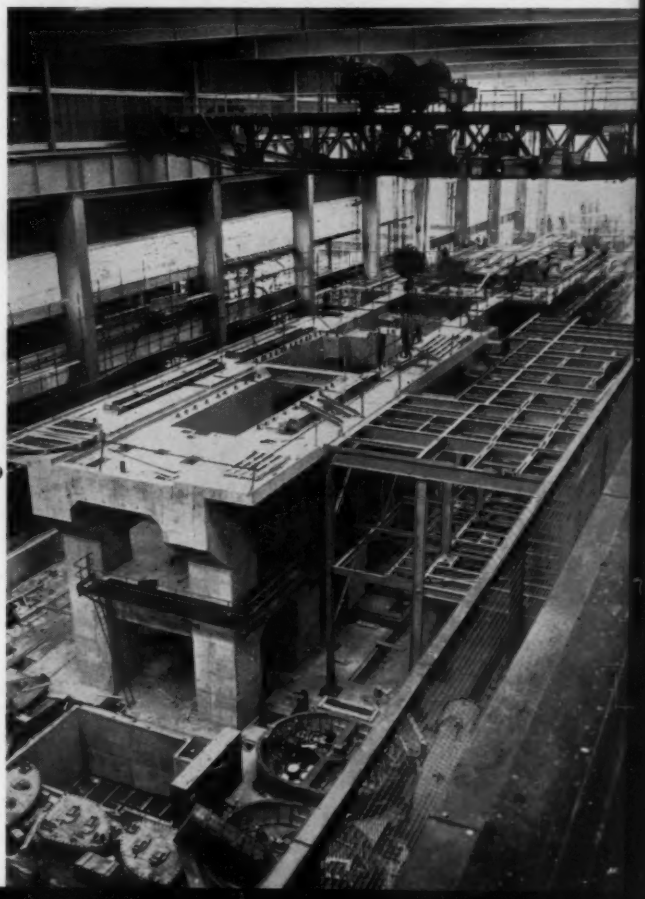
The exteriors of the combustion chambers of the first unit and the de-aerator (right) at the 69ft level

The foundation works for the main building structure comprise a deep raft section for the turbine house containing circulating water aqueducts, drainage and cable pipes, etc., with individual pile caps for the main columns in the boiler house. The loads on the boiler house columns vary from 500 to 1,500 tons per column. Each chimney has an octagonal pile cap bearing on 269 cast-in-situ piles of an average length of 20ft. The whole of the inside of the chimney is lined with acid-resisting brickwork and, in addition, the top section is formed wholly of brickwork anchored to the reinforced concrete shell by pre-stressed rods. The foundations for the cooling towers, coal and ash plant and ancillary buildings are of the raft type with individual footings where required. The turbo-alternator foundation blocks have overall dimen-



Above: The steam/water drum of the circulating system at the top of the first boiler

Below: The turbine line showing the completed block for No. 1 set in the foreground

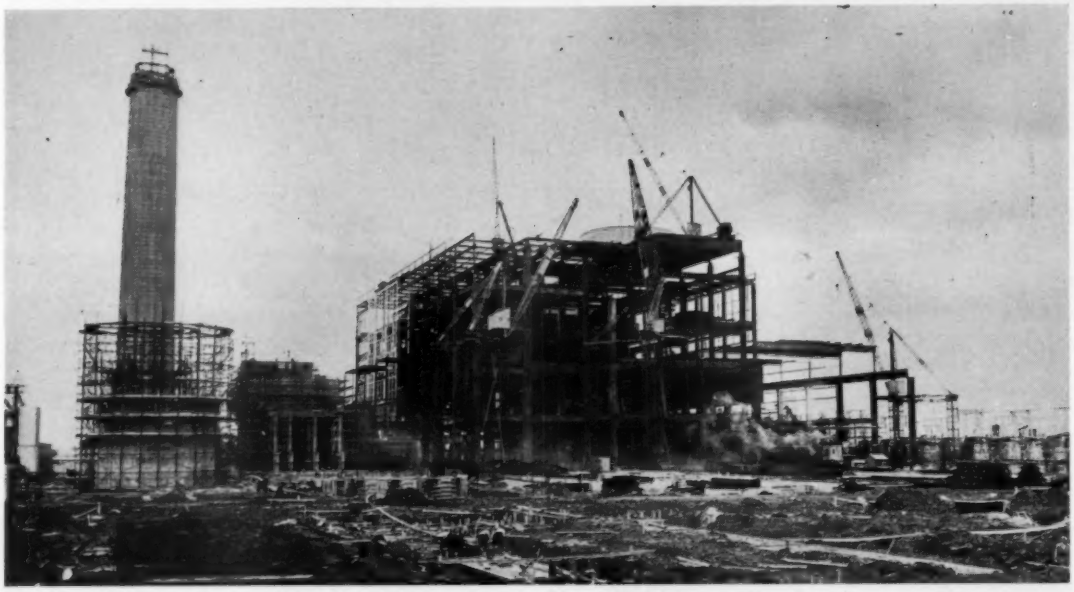


sions of 104ft long by 37ft wide including the overhung platform and the top of the block is 35ft above the turbine house basement level. The blocks are formed of concrete pre-stressed longitudinally, transversely, and vertically on the Freysinnet and Macalloy systems. The construction of the block is sectionalised to minimise shrinkage and creep movements.

The main building structure is designed round a steel framework, the main members of which are of mild steel welded box formation giving a very clean appearance. Plated girders are used for intermediate connections. The total weight of steelwork in the main building structure is 15,200 tons and high tensile steel grip bolts have been used for all connections subject to stress reversal. The coal bunkers are constructed of steel plate and are designed on the stressed-skin principle. The mid-span joints of the turbine house roof girders are site welded. The intermediate floors of the main building are of reinforced concrete, open steel grid or non-slip steel plate. Certain sections of the turbine house operating floor will be finished with tiling.

The cladding of the main building is of reinforced concrete walling faced with exposed aggregate slabs using Criggion grey-green granite chips inserted on the gable ends up to 43ft above ground level. The remaining section of the main building is clad with pressed aluminium alloy wall panels and suitably glazed. The aluminium sheeting to the turbine house section will have an integral thermal insulation lining. The roof of the main building will be formed of pressed sheet steel decking, insulated and waterproofed, and completely hidden by a parapet extension of the wall cladding. The combination of the aluminium sheeting, glazing and greenish tinged concrete slabs is such as to give a well-blended effect.

The precipitators are constructed of natural coloured concrete. The ancillary buildings will be mainly covered with light brown sand-faced bricks, but part of the

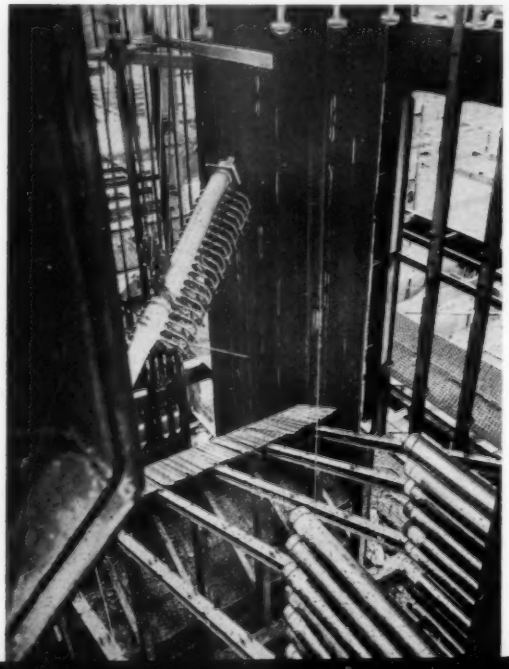


The central structure is the boiler house with the turbine hall to the right

circulating water pump house and all the coal conveyors will have aluminium cladding.

The turbine house is arranged with the turbo-alternators in longitudinal line on 120ft centres with the steam end of each set to the west. H.p. and l.p. heaters are situated in line parallel to the machine and on the side nearest the boiler house. A bled steam evaporator is installed adjacent to each heater group. The boiler feed pumps are situated in the turbine house basement to facilitate handling by the turbine house cranes. The booster feed pumps are in the basement of the control annexe between the turbine house and boiler house. Two 100ft span cranes are installed in the turbine house, the largest having a lifting capacity of 168 tons, this being the weight of the maximum lift, which is the alternator stator.

A superheater header being hoisted into position inside one of the combustion chambers at drum level

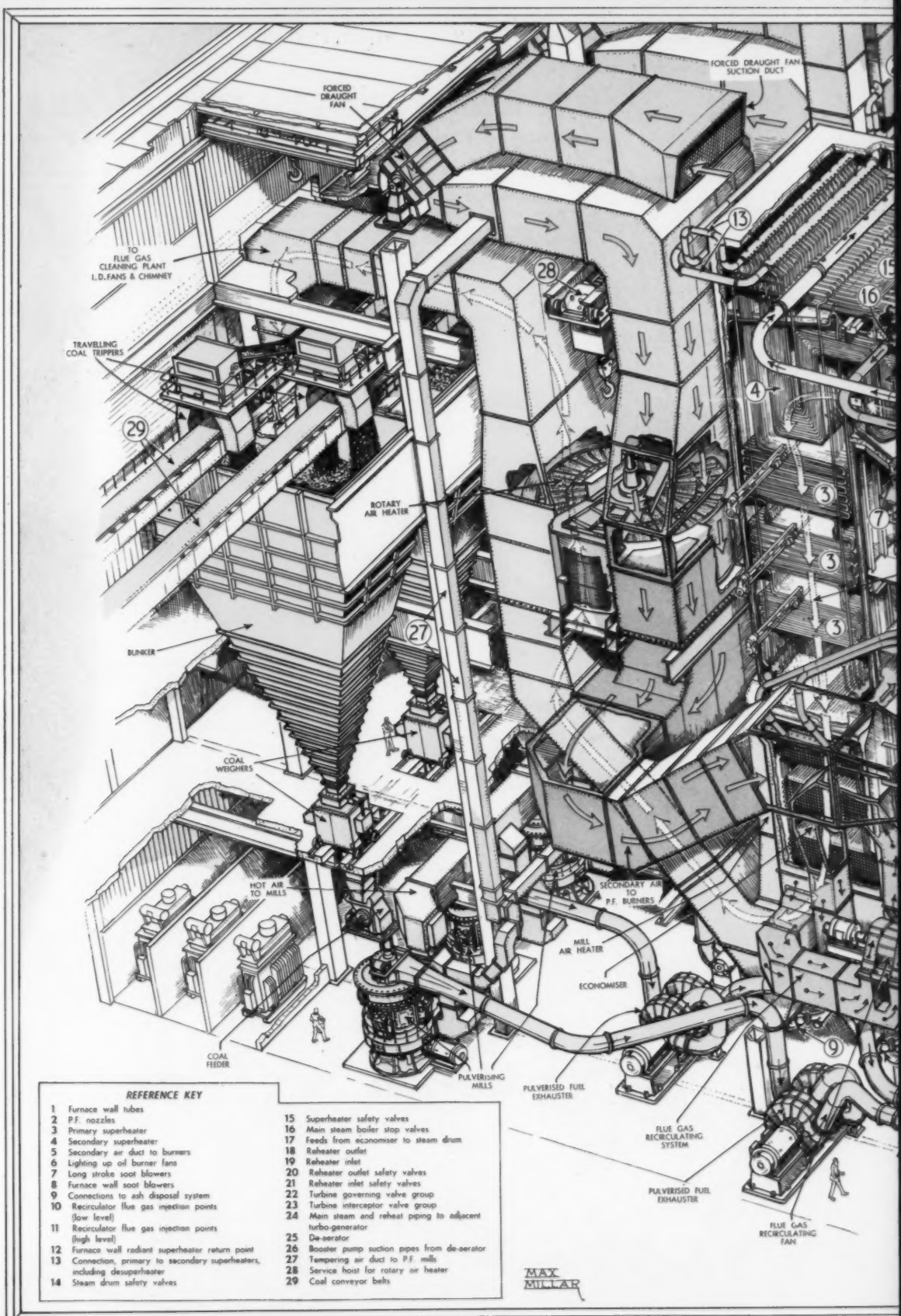


The twin furnace boilers are arranged in longitudinal line consecutive with the turbines, the bunker bay and coal milling plant being situated on the north side of the boiler house and away from the turbine house. Access to the various levels of the boiler house is provided by three lifts and four stair wells which are situated between the respective units and are also adjacent to the control annexe.

The unit control annexe is between the turbine house and boiler house and on the various levels contains the control rooms, de-aerators, reserve feed tanks, etc., associated with each unit. Five sections of the annexe are devoted to pipe shafts for the interconnecting pipework between the turbines and boilers. An annexe on the south side of the turbine house is provided to accommodate the auxiliary switchgear associated with the unit and common station services. The eastern part of this annexe forms the main station control room and station battery rooms. There are various offices for operating staff at the operating floor level in the turbine house annexe. An annexe is also provided on the north side of the boiler house for the electrical equipment associated with the boiler plant.

Certain items of main plant connected with the units are out of doors; they are the generator main and auxiliary transformers, electrostatic precipitators and induced draught fans. The generator transformers are sited south of the turbine house and are connected to the main switchgear compound by overhead 275 kV lines, the ends of which are supported from the turbine house structural steel. The twin banks of precipitators and induced draught fans are arranged in unit formation between the boiler house and the chimneys; in this area are also situated the dust pump houses and vacuum cleaning plant associated with each unit.

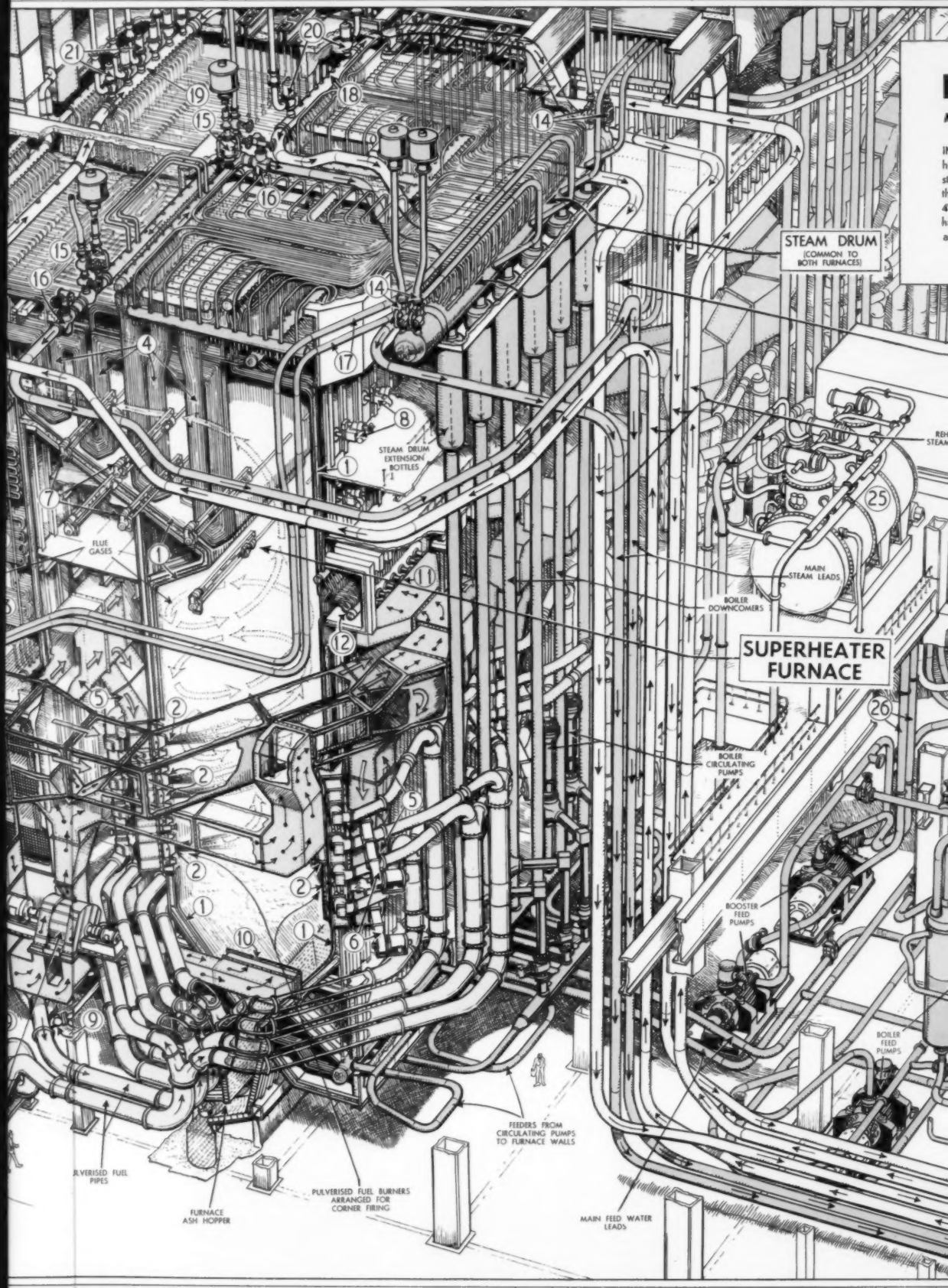
The forced draught fans are situated above the coal bunkers at a height of 118ft above the boiler house basement and a crane has been provided for the maintenance



REFERENCE KEY

1 Furnace wall tubes
2 P.F. nozzles
3 Primary superheater
4 Secondary superheater
5 Secondary air duct to burners
6 Lighting up oil burner fans
7 Long stroke soot blowers
8 Furnace wall soot blowers
9 Connections to ash disposal system
10 Recirculator flue gas injection points (low level)
11 Recirculator flue gas injection points (high level)
12 Furnace wall radiant superheater return point
13 Connection, primary to secondary superheaters, including desuperheater
14 Steam drum safety valves
15 Superheater safety valves
16 Main steam boiler stop valves
17 Feeds from economiser to steam drum
18 Reheater outlet
19 Reheater inlet
20 Reheater outlet safety valves
21 Reheater inlet safety valves
22 Turbine governing valve group
23 Turbine interceptor valve group
24 Main steam and reheat piping to adjacent turbo-generator
25 De-aerator
26 Booster pump suction pipes from de-aerator
27 Tempering air duct to P.F. mills
28 Service hoist for rotary air heater
29 Coal conveyor belts

MAX MILLAR



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HIGH MARNHAM: FIRST 1,000 MW POWER STATION

Now under construction for the C.E.G.B. East Midlands Division this station is situated on the west bank of the River Trent, near Newark

IN THIS PICTURE are shown the main steam raising units of one of the five similar boiler and turbo-generator sets of this new high-capacity station. Each boiler has two furnaces side by side, corner-fired by pulverised fuel burners, and is coupled to one main steam drum. Steam generated at 2,450 p.s.i.g. and 1,060 deg F is fed to the h.p. cylinder of the turbine from the superheater above the superheater furnace and returned to the heater above the reheater furnace and then passed to the i.p. turbine cylinder at 426 p.s.i.g. and 1,000 deg F. The main circuits, i.e. boiler feed and circulation, superheater inputs and outputs, forced draught and heater air, gas recirculation, coal and pulverised fuel supply are shown, and the layout of the turbo-generators, water heaters, and condensers is illustrated as a whole. Some idea of the great size of the boiler can be gained from the fact that it is 130ft in height from basement to main steam drum.

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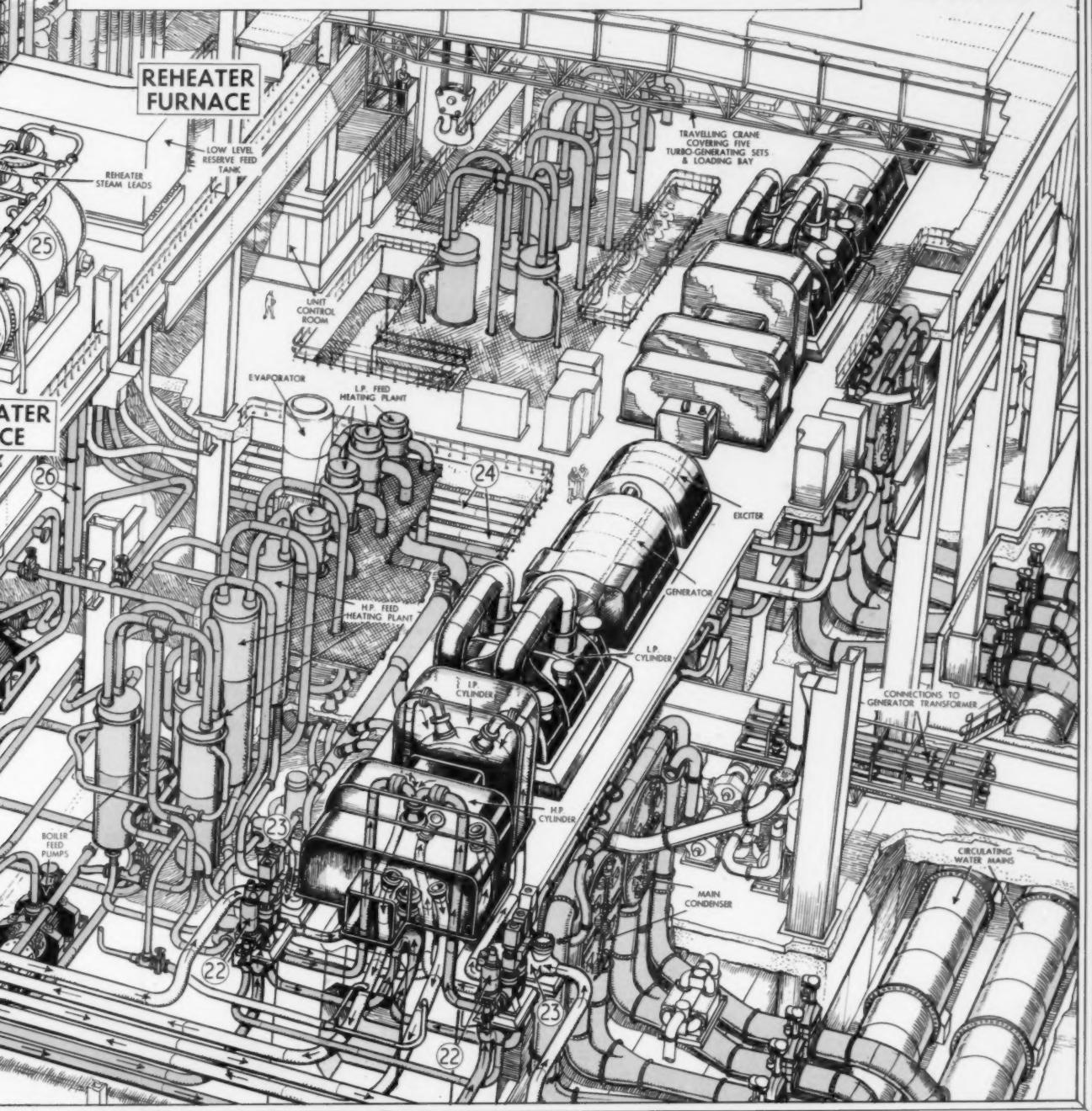
ELECTRICAL REVIEW

A GRAPHIC ILLUSTRATION PREPARED BY THE TECHNICAL STAFF OF ELECTRICAL REVIEW WITH THE GENEROUS CO-OPERATION OF THE CENTRAL ELECTRICITY GENERATING BOARD, THE INTERNATIONAL COMBUSTION LTD. AND THE ENGLISH ELECTRIC CO. LTD.



of the fans and for lowering sections to ground level. The general layout of the boiler house and turbine house has been designed on the unit principle to facilitate erection, making each unit operationally identical.

The radiant type boilers have been designed to burn untreated smalls and washed smalls obtained from the East Midlands Division of the National Coal Board and the rate of evaporation is 1,400,000 lb/hr for Nos. 1, 2 and 3 boilers and 1,350,000 lb/hr for Nos. 4 and 5 boilers at continuous maximum rating. The conditions of operation are such that steam will leave the superheater at a pressure of 2,450 p.s.i. and a temperature of 1,060 deg F. The steam will return from the turbine to the reheater at a pressure of 476 p.s.i. and with a temperature of 667 deg F. The reheater outlet steam temperature will be 1,005 deg F.

The boilers have separate superheat and reheat furnaces with all pressure parts slung from the main building overhead steelwork. The furnaces are fully cooled, corner fired, and an assisted circulation system is employed to ensure a positive circulation through the furnace system. The unit is arranged with two similar furnaces connected on the steam and water side in parallel with a common steam drum via downcomers, circulating pumps and distributing drums at the bottom of the furnaces. The furnaces are described as "superheater" and "reheater" as characterised by the situation of the secondary superheater at the exit of the one and the reheater at the exit of the other. Similar primary connections, and radiant superheater stages are installed in both furnaces. The furnace is completely water cooled below rear wall arch level and, in the main, is steam cooled above this level. An entirely new type of casing has been adopted. This is of the skin-cased cubic expansion design which prevents deterioration of the insulation by the elimination of gas leakage from the furnace.

The gas and air ducting connections to the furnaces are such that one induced draught fan and one forced draught fan are normally associated with each furnace, but it is possible, by the use of dampers, to connect a single fan of either type to both furnaces. The air is drawn from the upper part of the boiler house to conserve the radiated heat and to assist the boiler house ventilation.

A welded economiser and a rotary air heater are situated at the rear of each furnace above operating level. Two secondary air heaters provide a supply of hot air to the coal pulverising mills. The furnaces are started up on oil fuel and normal firing is by pulverised coal. Six mills are installed for each boiler, their capacity being such that with the normal fuel four mills will be sufficient to meet full load on the boiler. The arrangement of fuel piping permits three mills to feed each furnace independently, but a cross-over device enables either of the two centre mills to be connected to either furnace. The latter arrangement ensures extra availability during times of maintenance on individual mills.

Each furnace is fitted with sixteen pulverised fuel burners, four at each corner to give tangential firing. The burners are of the tilting type to give control of the temperature of the steam leaving the superheater and reheater. Spray desuperheaters are connected in the steam lines as an emergency control to maintain the steam temperature at a safe level during abnormal operating periods.

Duplicate pairs of 100 per cent capacity multi-stage boiler feed and booster pumps are installed for each unit. They are electrically driven and the combined h.p. of the motors driving each main pump and booster pump unit is 7,725 h.p. Both motors are direct-on started and

Looking up inside the first cooling tower, 340ft high and 260ft maximum diameter; note slender supports for shell

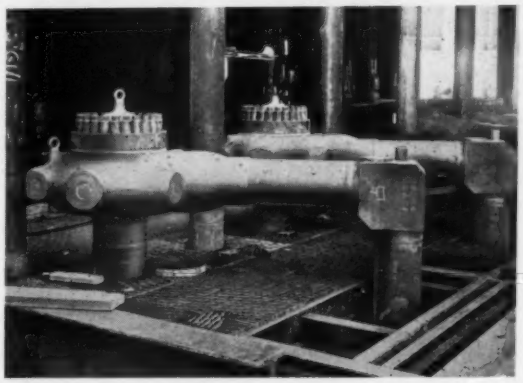
are controlled by a single 6·6 kV circuit - breaker. Each main and booster pump is fitted with a flow controlled "leak-off" and, in addition, each main pump is fitted with an automatic thermal "leak-off" arranged to operate in the event of the feed water exceeding a predetermined temperature.

The 200 MW turbo-alternators have tandem three-cylinder impulse reaction turbines designed for steam conditions of 2,350 p.s.i. and 1,050 deg F at the h.p. inlet valve and 475 p.s.i. and 1,000 deg F at the i.p. inlet valve. The difference between these conditions and those quoted for the boiler are accounted for by the losses in the pipework. The nominal speed of the turbine is 3,000 r.p.m. and the unit is designed to give its 200 MW output as the most economical and continuous maximum rating at 0·9 lagging power factor. Feed water is heated to a maximum temperature of 460 deg F and feed water de-aeration plant has been included with the provision for off-load de-aeration.

The turbine is fitted with a single shell condenser designed to give an exhaust pressure of 1·3in Hg (0·64 p.s.i.a.) at c.m.r. when using cooling water at a design temperature of 60 deg F. Mechanical type air extraction pumps are provided for normal running and for quick starting. Other turbine auxiliary plant is of the conventional type but suitably rated for the larger machine.

Each alternator will have a terminal voltage of 16·5 kV and a rated phase current of 7,780 A at 0·9 power factor. The stator and rotor have tubular conductors directly cooled by hydrogen at a pressure of 30 p.s.i. circulated by blowers gear driven from the main shaft. Pilot and main exciters are also gear driven from the main shaft. The maximum output of the main exciter is 3,000 A at a rated voltage of 520 V; the speed of the exciters is 750 r.p.m. The weight of the complete turbo-alternator set is 1,450 tons. Operational features of the station will be dealt with in our next issue.

The four boiler circulating pumps, without drives but with testing plates, for the first unit



Power Supply in Brazil

FROM OUR RIO DE JANEIRO CORRESPONDENT

AT the present rate of progress the generating plant capacity targets set by President Kubitscheck of Brazil in February, 1956, when he assumed office should be reached without much difficulty. Installed capacity is to be raised to 5,000 MW by 1960 and 8,000 MW by 1965. At the end of 1957 the total capacity was 3,750 MW, a net addition during the year of 679 MW. The following are the principal hydro-electric projects now being carried out, with capacities in MW:—Paulo Afonso (extension), 120; Peixoto, 400; Piratininga (duplication), 250; Cubatao (extension), 390; Jurumirim, 100; Barra Bonita, 100; Ponte Coberta, 90; Euclides da Cunha, 98; Camargo-Itutinga, 60; Jacui, 69; Juquia, 68; Furnas (final), 1,100; Tres Marias (final), 520; total, 3,365 MW.

The Government estimates the expenditure to be incurred on these projects during the years 1957 to 1961 at 85,700 million cruzeiros (about £425·8 million at the free exchange rate). This sum includes provision for a 13·5 per cent increase in building costs, due to inflation, and 11,200 million cruzeiros for interest on loans and amortisation payments. Equipment valued at $(U.S.) 225 million is to be imported up to 1961, and is being supplied on deferred payment terms. Arrangements for meeting the expenditure in national and foreign currencies are guaranteed until 1961 and credits, amounting to $(U.S.) 203 million for imports to complete the projects after that date, are now being negotiated.

The Brazilian Development Council calculates that the following amounts will be available from Federal, State and private resources during the five-year period 1957 to 1961 to finance the extensions:—Federal resources: proceeds of the Federal Electrification Fund, 13,000 million cruzeiros, and budgetary allotments, 7,000 million. State resources: part of the sole tax on electric power consumption and specific taxes imposed by the States to develop regional electrical supplies, 26,000 million cruzeiros; State budgetary allotments, 480 million. Private resources: amounts re-invested by concessionary companies and new capital invested, 13,000 million cruzeiros.

The difference between available resources (52,582 million cruzeiros) and the estimated cost of the schemes (85,700 million) would be covered by loans from the Brazilian Bank for Economic Development and the Washington banks.

Private Investment

New private capital will depend on the approval, or rejection, by Congress of the Executive Bill altering the legal status and regulations of public service companies. The president of the American & Foreign Power Company said recently that his subsidiaries would invest $300 million in Brazil during the next five years if the Bill became law, otherwise their investment would not exceed $50 to $60 million.

The Bill before Congress provides for payments on capital invested in electricity services at the rate of 12 instead of 10 per cent. A much more important provision is that it permits the value of the invested capital to be adjusted in accordance with the variation in the purchasing power of the national currency. As a temporary measure, pending Parliamentary approval of the Bill, President Kubitscheck has issued regulations fixing a more flexible system of tariffs and introducing certain other more favourable conditions. These, however, are in the nature of palliatives and are not likely to attract private capital on a large scale.

In addition to the major projects mentioned above, several thermal power stations are being built in municipalities where no hydraulic power is available and in the vicinity of the southern coalfields. Plants with an aggregate capacity of 109 MW started production in 1957 and others totalling 190 MW are scheduled for completion this year.

Large British-Built Station

Despite the many extensions, a shortage of electric power is predicted during the next three years in Rio de Janeiro, Sao Paulo and Belo Horizonte, capital of Minas Gerais. The situation will improve after 1962, when the Furnas project, referred to in the *Electrical Review* of 26th April, 1957, is due for completion. Twenty-two firms, including fifteen from overseas, competed for the tender for the power station, which was awarded to a British firm, George Wimpey & Co. Twelve generating plant groups will be installed, supplying the Rio, Sao Paulo and Belo Horizonte systems with an additional 1,200 MW.

Work was started in 1957 on another important project, the Tres Marias Dam, which will store 22,000 million cu m of water, regulate the flow of the Sao Francisco River and irrigate 1,300 sq km of marginal lands (see *Electrical Review*, 13th July, 1956). The power station will have an initial capacity of 520 MW, to be raised eventually to 880 MW.

Sao Paulo Developments

In Sao Paulo two mixed-economy companies are building a chain of stations with a combined capacity of 434 MW and will sell power to local distribution firms. In April last the first 17 MW of the Salto Grande station, now known as Lucas Nogueira, was inaugurated on the Parapanema River. Its capacity will be raised to 68 MW later. This plant represents the first step towards the full utilisation of the hydraulic power of the Parana-panema, which divides Sao Paulo from Parana. The other falls to be harnessed are those of Juramirim, Itarare, Piraju and Ourinhos. These stations will eventually produce 700 MW, supplying power to 51 municipalities in Sao Paulo and 24 in Parana.

In north-east Brazil the Companhia Hidroelectrica do Sao Francisco is building a second underground power house at the Paulo Afonso station. Two 60 MW generators will be installed, additional substations built and transmission lines extended to increase supplies to Pernambuco, Alagoas, Bahia, Paraiba and the southern part of Ceara. The present capacity of the Paulo Afonso station is 180 MW, of which 140 MW is used, but additional power will be required if Reynolds Aluminium or the Kaiser Company succeed in their negotiations with the Brazilian Government to build aluminium factories in the vicinity.

An agreement has been signed between the Sao Francisco Valley Commission and the Pan-American Union to co-operate in an experimental rural electrification project. The objects are to promote economic development and co-ordinate irrigation services.

Pole-Amplitude Modulation

New Method of Changing the Speed of Induction Motors

By G. H. RAWCLIFFE, M.A., D.Sc., M.I.E.E.*

Summary of the paper by Professor G. H. Rawcliffe, R. F. Burbidge, Ph.D., Graduate I.E.E., and W. Fong, Graduate I.E.E., entitled "Induction Motor Speed-Changing by Pole-Amplitude Modulation" published in the *I.E.E. Proceedings*, Part A, August, 1958, Vol. 105, pp. 411–419

A PAPER published in the last issue of the *Proceedings* of the Institution of Electrical Engineers describes a new method of changing the speed of squirrel-cage induction motors[1] which may well find many applications. Ultimately, this method causes a change in the number of poles in the motor, but the change is brought about by using a principle of considerable generality and flexibility, to which it has been thought desirable to give the new and distinguishing name of "pole-amplitude modulation."

Disadvantages of Earlier Methods

Various methods of changing the number of poles in an induction motor have long been known, but most of them have suffered from one or more of the following serious disadvantages:—

(a) That the magnetic flux in the machine has its full value for one speed only, and at the other speed the machine is seriously underfluxed, and thus deficient in torque and power ratings.

(b) That, at one speed or the other, the m.m.f. waveform differs seriously from the sinusoidal ideal, with consequent stray load-loss, heating, noise and vibration. Above all, harmonics in the m.m.f. waveform may cause large distortions of the speed-torque curve, with resultant tendencies to crawl.

(c) That, because of one or other of the effects mentioned in (a) or (b), or because of the inevitable chording of the winding for one speed, the output power at either or both speeds is very much below the rating which would normally be obtained from the same frame if it were wound with a single winding for the same speed.

(d) That a large number of control leads and terminals, and a correspondingly large and expensive controller, are required to start the motor and to change the speed.

The new method of changing speed very nearly attains perfection in relation to the properties under (a) and (d), and is substantially better than other methods previously proposed in regard to the qualities given under (b) and (c).

* University of Bristol.

[1] British Patent Applications Nos. 27112/57 and 17022/58.

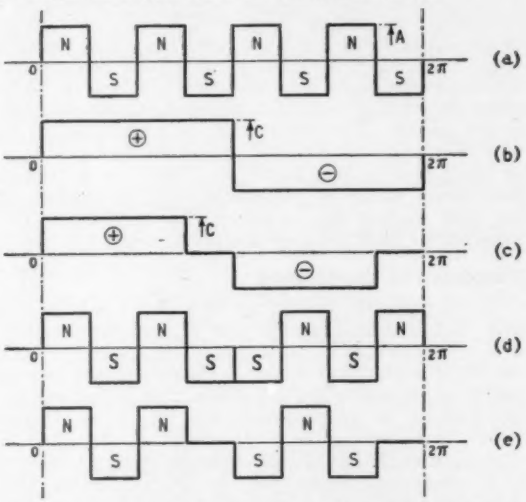


Fig. 1.—Principle of pole-amplitude modulation: 8 poles modulated to 6/10 poles

(a) Original M.m.f. (b) Modulating wave: all coil groups in circuit. (c) Modulating wave: two coil groups omitted. (d) Amplitude-modulated m.m.f. (e) Amplitude-modulated m.m.f. with two coil groups omitted

Available Speed Combinations

The only ratio of speed change, using one winding, which has hitherto been extensively used is 2 to 1; but this fact is probably not due to this particular speed ratio being the one universally desired. It is much more probable that the mere existence of a simple and satisfactory 2 to 1 speed-changing squirrel-cage induction motor has caused it to be used whenever speed change of this order is wanted.

Another recent I.E.E. paper[2] described the final forms of a satisfactory 3 to 1 speed-changing motor, which gives good performance and is reasonably simple as it has only nine control leads in all for the two speeds. At the I.E.E. discussion of the first paper about this 3 to 1 speed-changing machine, it was asked what applications were foreseen. The present writer replied that industrial motor applications are so many and varied that it is almost impossible to suppose that any motor of efficient characteristics will not, in due course, find an appropriate use. This is equally true about the new methods of

[2] "Two improved chorded windings for 3 : 1 pole-changing." *Proc.* I.E.E., Part A, February, 1958, Vol. 105, pp. 62/66, by Professor G. H. Rawcliffe, M.A., D.Sc., M.I.E.E., and N. L. Garlick, A.M.I.E.E.

pole-amplitude modulation, but several new machines of different speed ratios recently seen by the author could, it is believed, have been made more simply and cheaply by the methods which the paper discusses.

A great merit of this new method is that, in general, only six control leads and a very simple type of controller are required, and this is a striking advance on almost all the forms of pole changing previously devised. The controller required is identical with that which is needed for 2 to 1 pole changing, and is therefore already in standard production. The method is general and flexible, but is particularly applicable to close ratio speed changes such as 8/10 or 10/14, for example. It is believed that the availability of such speed-changing induction motors, which are both simple and satisfactory in performance, will lead to their employment in place of double-wound machines or, in some cases, instead of variable-speed motors.

Explanation of Principle

The principle of the new method can be most simply explained by considering an example.

One phase winding of a three-phase induction motor will give a nearly sinusoidal waveform of m.m.f. (M_θ) which may be expressed, for the example given in Fig. 1 (a), as $M_\theta = A \sin p\theta$, where A is the amplitude and p is the number of pole pairs (p=4 in this case, and a rectangular wave is drawn, for simplicity, rather than a sinusoidal wave).

Now suppose that the amplitude (A) of this wave could be varied sinusoidally with angular position around the perimeter, or "modulated" in space, as the process can be described by analogy with radio waves. The m.m.f. amplitude would then be expressible as $A = C \sin k\theta$, where C is a constant, and k may be any whole number (k=1 in this example). This wave of amplitude is also shown conventionally, as a rectangle, in Fig. 1 (b). The resultant modulated wave would then be given by

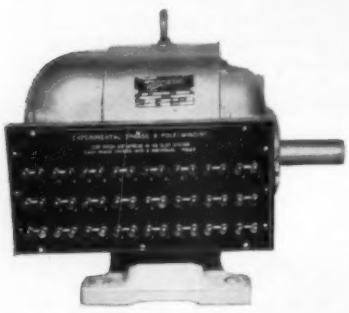


Fig. 2.—8/10 pole experimental machine

$$M_\theta = C \sin k\theta \sin p\theta$$
$$= \frac{C}{2}\left[\cos (p-k)\theta - \cos (p+k)\theta\right]$$

This represents a mixed field of two pole numbers (in this case 6 and 10) superimposed, which is illustrated diagrammatically in Fig. 1 (d).

Under certain conditions and by correct relative displacements between the three separate phase windings, it is possible to eliminate one pole number from the resultant three-phase field and to obtain a pure three-phase rotating field of the other pole number. The full analysis of the conditions under which this can be done is developed mathematically in the paper. In the particular example, the six-pole field can be eliminated, and thus the resultant obtained by modulating the three-phase eight-pole rotating field is a three-phase 10-pole rotating field.

The synchronous speed of the machine is therefore changed, in this example, from 750 r.p.m. to 600 r.p.m. for a 50 c/s supply. A small test machine for these speeds (3 h.p. at eight-pole speed) is described, with test results, in the I.E.E. paper (Fig. 2). For the purpose of carrying out experimental tests, the test machine was wound with the ends of every coil group separately brought out to terminals, which permitted a variety of tests to be made in quick succession. The performance obtained in the eight-pole connection was as good as that of a single-winding machine for the same pole number; and the power rating for 10-pole operation was about three-quarters of that for a single-speed 10-pole machine in the same frame. This is a very good overall performance, and almost certainly better than could be obtained from the same frame with two separate windings. Nonetheless, since the I.E.E. paper was written, considerable improvements in the method have been perfected, and it is hardly too much to say that the final form of the test machine described in the paper, though wholly satisfactory, is now technically obsolete. Extensions of the same method have already yielded substantial improvements in performance.

Method of Modulation

In this paper, the method has been shown to be applicable only to certain combinations of pole numbers, but each phase winding with respect to the first. This is equivalent to modulation by a rectangular wave, as shown in Figs. 1 (b) and 1 (d). On reversal, it is possible to omit a coil group from each half of the winding, which is equivalent to modulation by a shortened rectangular wave, as shown in Figs. 1 (c) and 1 (e). Neither of these is, of course, exactly the same thing as modulation by the ideal sinusoidal wave $C \sin k\theta$, but it has been shown both in theory and by test that the second alternative, in which certain coils are omitted, approaches sufficiently near to the ideal for very satisfactory results to be obtained.

Reversal of one half of each phase winding, with or without omission of certain coil groups, can be obtained by various forms of series-parallel connection. There is a great variety of possible methods of modulation, coil interconnection, and switching, with or without omission of some part of the winding on modulation, all the preferred connections having only six control leads. The machine performance is greatly affected by the extent to which the winding is chorded, as shown by tests recorded in the paper. The phases may be interconnected in parallel-star/star or in parallel-star/delta, for a pole ratio of (p_1/p_2) or (p_2/p_1), at choice. There is an almost bewildering variety of possibilities, and the strength of the new method lies largely in this flexibility. The details of the connections are discussed in the I.E.E. paper.

Extension of the Method

In this paper, the method has been shown to be applicable only to certain combinations of pole numbers, but it is now known to be possible to extend it to a greater variety of such combinations. Theoretical and experimental investigations are continuing, both to improve the performance for pole combinations which are already known to be within the scope of this method, and to extend the method to new combinations of pole numbers. It is confidently hoped that the method, when fully developed, will form a substantial contribution to the problem of obtaining a simple two-speed squirrel-cage induction motor, with one cheap and simple winding, which can run efficiently near to any two synchronous speeds which may be selected.

I.E.C. IN STOCKHOLM

Work of the Technical Committees

FROM A CORRESPONDENT

Continuing the report on the proceedings at the 1958 Grouped Meeting of the International Electrotechnical Commission in Stockholm (see last week's issue, page 300), in the following pages an account is given of the work of a number of other Technical Committees. The Charles le Maistre Memorial Lecture given by Prof. R. Vieweg is also reviewed and mention is made of the visits and social functions arranged in connection with the meeting

Technical Committee No. 15, Insulating Materials. This committee, together with its Experts Committee and seven of its working groups, met in Vasteras. It was felt by some delegations that more precise instructions should be given to the working groups regarding their method of conducting business, and arising out of this a document was prepared outlining the procedure to be followed. It was emphasised that the idea behind the formation of working groups was that specific tasks could be dealt with more quickly by small groups of experts than by large committees, and that these small groups should endeavour to meet more frequently than the main committee, unless, of course, they could make satisfactory progress by correspondence.

When TC/15 was first set up some years ago, and before the setting up of working groups, responsibility for the general progressing of the work was entrusted to an Experts Committee. At the Stockholm meeting it was decided that the Experts Committee should now be replaced by a Steering Committee consisting of the chairman and secretary of the main committee and the chairmen of all the working groups, together with three independent members selected from countries other than those from which the chairmen were drawn. A new working group was set up to study the influence of radiation on insulating materials.

As a result of the Stockholm meeting two documents will be circulated for approval under the six months' rule, dealing with methods of test for electric strength and for insulation resistance respectively. In addition, four documents will be circulated under the six months' rule after a delay of nine months if in the interim no serious comments are received. These relate to the conditioning of insulating materials for all types of electrical tests, the special conditioning requirements for the measurement of insulation resistance, a guide on test procedures for the thermal evaluation of insulating materials, and a test procedure for the thermal endurance of enamelled wire.

A document, giving a method for determining the comparative tracking index of solid insulating materials, was agreed last year for circulation under the six months' rule. As the result of comments submitted with the votes some amendments to the draft have been circulated for approval under the two months' procedure. This test is also of particular interest to the International Commission on Rules for the Approval of Electrical Equipment (the C.E.E.), and a method of test jointly agreed by the two organisations is now within sight of realisation.

Technical Committee No. 17, Switchgear and Control Gear. The main committee and the Sub-committee on Low-Voltage Switchgear (17B) met in Stockholm and the Sub-committee on High-Voltage Switchgear (17A) met in Ludvika. Sub-committee 17A continued the discussion, started in Moscow last year, on rules for isolators and earthing switches. A new draft will now be prepared for circulation under the six months' rule. Preliminary consideration was given to some proposals for the ratio between symmetrical and asymmetrical breaking capacity. The U.K. delegation were not entirely happy about the proposals, but sufficient progress was made to enable instructions to be given to the Secretariat for the preparation of a new proposal for consideration at the next meeting. The Secretariat was also asked to prepare a new draft of rules for rating and testing circuit-breakers with respect to the switching of line-charging currents. A preliminary draft was discussed in Moscow last year, and at the Stockholm meeting it was decided to confine the scope of the rules to no-load line switching. The question of rules for the rating and testing of circuit-breakers with respect to cable switching will be discussed at the next meeting.

The Secretariat of Sub-committee 17B had prepared new drafts of two major documents to take account of the discussion which took place in Moscow last year. One of these documents deals with low-voltage circuit-breakers and the other with contactors. It was decided at the present meeting to concentrate on the circuit-breaker document, and sufficient progress was made on points of principle to permit of the completion of the document to be referred to a working group. It is hoped that this working group will present a report in time for a further meeting of the sub-committee to be held next year.

At the same time work will proceed in connection with the document dealing with contactors, and here again a working group was set up. A similar procedure was adopted to deal with a document on creepage distances and clearance distances in air for low-voltage apparatus. This subject is also of interest to Technical Committee No. 18, Electrical Equipment in Ships, and close liaison between the two committees will be maintained.

Technical Committee No. 20, Electric Cables. This committee (for which the B.S.I. acts as Secretariat) met in Copenhagen. For some years past the committee has been discussing tests on high-voltage solid-type and oil-filled paper-insulated cables, but at the meeting in Moscow last year a start was made on rules for the testing of gas-pressure cables for voltages up to 275 kV. In all these discussions there have been some differences of opinion with regard to the classification of the tests as type tests and routine tests. The British view, which at first was not strongly supported, was that a specification requiring

sample tests to be taken on cables at definite intervals during production, irrespective of the nature of the contract, was costly and undesirable as it did not necessarily lead to useful information being obtained. The U.K. delegation felt that the principle of type-approval testing established over many years in this country should be introduced into I.E.C. specifications. This question was not resolved at the meeting in Moscow last year and a working group had therefore been set up to give the matter further consideration, with special reference to gas-pressure cables. The working group held a meeting in Paris in October last year, but failed to reach agreement on the classification of tests. Consequently, at the meeting in Stockholm the main committee had before it two alternative drafts for gas-pressure cables, one based on the U.K. ideas regarding type-approval testing and the other based on sample testing.

The British viewpoint gained more support than on previous occasions, largely because of the complications involved in terminating and pressurising each piece of cable allocated for testing. A compromise solution was eventually found, and the committee agreed to put all the tests in a single section of the specification without any grouping into type tests and sample tests. Explanatory paragraphs were added to assist the purchaser in deciding what would be a satisfactory and economic amount of testing to specify in relation to a particular contract. On the basis of this solution the Secretariat will now prepare further drafts covering internal gas-pressure cables and external gas-pressure cables respectively for consideration at the next meeting.

The committee also reviewed once again the results of its work over the past few years, as contained in a draft specification for tests on oil-filled cables. This draft had already been circulated for approval under the six months' rule, but certain modifications will now be introduced to bring the draft more into line with the decisions reached regarding gas-pressure cables and the revised draft will be circulated under the two months' procedure.

Technical Committee No. 22, Static Power Convertors. As usual, this committee had a long agenda, and the main committee and its sub-committee on semi-conductor rectifiers both met in Ludvika as well as in Stockholm. The work borders on, and tends to overlap, that of TC/39 in so far as both committees deal with semi-conductor devices. Some time was therefore spent, both in formal and informal discussion, in re-defining the scope of TC/22 and in setting up machinery for continuous liaison with TC/39, the latter committee being responsible for work on semi-conductor rectifiers for telecommunication equipment (other than for power supplies to such equipment). This liaison between TC/22 and TC/39 is particularly important in connection with matters such as definitions, symbols and methods of test.

Only brief consideration could be given to some proposals submitted by Germany for a specification for mercury-arc invertors, and the proposals were therefore referred to the national committees for study. The U.S.S.R. delegation reported that they were making progress with the drafting, as promised at the Moscow meeting last year, of proposals for mercury-arc convertors for special applications, e.g. reversible electrical valve drives, high-voltage travelling units and frequency-changer units. Future work will also cover the standardisation of failure limits for different types of convertor, and heat tests for special tropical conditions.

The sub-committee on semi-conductor rectifiers has for the time being completed its work on polycrystalline semi-conductors, and a draft specification is at present under the six months' rule. Attention is now being concentrated on monocrystalline semi-conductors, and the general view of the sub-committee is that development is proceeding at such a rate that rigid standardisation is premature. It is therefore proposed to draft a document in the form of a tentative specification, but to defer its issue as an I.E.C. Publication until practical experience has been gained in the application of the proposed recommendations.

Technical Committee No. 23, Electrical Accessories. The work of this committee covers very much the same ground as part of the work of the C.E.E., the main difference being that the I.E.C. endeavours to obtain world-wide agreement whereas the C.E.E. is concerned only with practice in Europe. It is clearly desirable to maintain the closest possible liaison between the two organisations, and a most valuable feature of the liaison machinery is that the chairman of I.E.C. TC/23, Prof. J. C. van Staveren (Netherlands) is also president of the C.E.E.

The subject of fuses was one of the main topics discussed. For the past year or two a working group has been drafting a specification for the performance testing of miniature fuses of the type used in plugs, radio receivers, etc., and the working group's proposals, together with comments thereon from the national committees, were reviewed in Stockholm. A revised draft has now been agreed for circulation under the six months' rule subject to one or two points being further considered by the working group. This draft will include " Standard Sheets " giving the dimensions of 20 by 5 mm quick-acting high breaking capacity and low breaking capacity fuse-links. The working group was asked to continue its work so that standard sheets can, in due course, be issued for time-lag fuse-links and for the 1¼ by 1¼in links.

Having disposed of miniature fuses, the committee then went on to review a draft specification for fuses rated up to 200 A for domestic and industrial purposes. This draft was based on the corresponding C.E.E. specification and deals with the " B " type (as used in the U.K.) and the " D " type (as used in many Continental countries). Some modifications to the draft were made and a revised version will now be circulated under the six months' rule.

Screw (Edison-type) lampholders next claimed attention. A draft, based on the corresponding C.E.E. specification, had already been circulated under the six months' rule, but the comments received from the national committees indicated the need for further amendments, particularly as regards the temperature limits. Some revised (higher) values were discussed and will be included in a new draft of the specification which will now be circulated for comment. This means that, in effect, the six months' rule draft has not received sufficient support and has been withdrawn in favour of the new draft which, after the next meeting, will again go through the six months' rule procedure.

Technical Committee No. 24, Electric and Magnetic Quantities and Units. This committee, together with TC/25 (see below), maintains liaison with the I.S.O. Committee on Units and Symbols and with the Symbols and Units Committee of the International Union of Pure and Applied Physics. The committee reviewed a number of proposals, formulated at the Philadelphia meeting in 1954 in the form of " resolutions," and among the decisions reached were the following:—

(i) The positive sign shall be given to the reactive power absorbed by a reactance. A note to this resolution states that reactive power is considered as being produced, transmitted or absorbed under the convention that a capacitor produces it and a reactance absorbs it. Consequently it is not necessary to use the adjectives

"inductive" and "capacitive" to qualify the term "reactive power."

(ii) The "system of international units" shall be the system founded on the basic units adopted by the Tenth General Conference on Weights and Measures, namely, the metre, kilogramme, second, ampere, candela and degree Kelvin.

(iii) The name "Giorgi" shall be used to designate the system of units based on the first four basic units mentioned in (ii). The designation MKSA is also recognised for this system of units.

(iv) The Secretariat will draw up a document bringing together all the decisions taken over the years by TC/24. This will be most valuable, as no formal publication has yet been issued as the result of the committee's work, and its findings can only be discovered by delving into the minutes of meetings.

(v) The National Committees are to be asked for their views regarding a proposal from the U.S.S.R. that the name "Lentz" shall be given to the unit of magnetic field in the Giorgi system.

At the meeting of the I.E.C. Technical Committee on Insulating Materials in Stockholm: Left to right, Mr. Sommerman (United States) with Messrs. A. Collins, J. F. Stanley, R. I. Martin and R. Snadow (United Kingdom)

Technical Committee No. 25, Letter Symbols and Signs. This committee is responsible for I.E.C. Publication 27, Letter Symbols Used in Electrotechnics, the third edition of which was published in 1953. A fourth edition is now in preparation, and two working groups were set up, on electronics and communications and on static convertors respectively, with instructions to establish contacts with the appropriate organs of the International Telecommunications Union and with the Secretariats of other interested I.E.C. committees.

Technical Committee No. 28, Co-ordination of Insulation. This committee is responsible for I.E.C. Publication 71, Rules for Insulation Co-ordination, a new edition of which is now in preparation. It is proposed to introduce correction factors for the effect of altitude, and for this purpose the assistance of the committee on high-voltage testing techniques will be sought. An application guide, to be issued as a supplement to Publication 71, is also in preparation.

Technical Committee No. 35, Primary Cells and Batteries. This committee met in Copenhagen, and amongst the new items discussed were the dimensions and discharge capacities of batteries for transistorised radio receivers and for photo-flash equipment. Three sizes of 9 V batteries were adopted for the first-mentioned application, and three round cells and one flat cell were agreed upon for photo-flash guns. Several "odds and ends" which had been left open in I.E.C. Publication 86, Dry Cells and Batteries, were settled, but the main discussion concerning this publication was centred on a Netherlands proposal for a complete re-casting of the form of publication. The present form is generally agreed to be awkward, which is not to be wondered at in view of the way the document has had "bits" added to it from time to time. When the publication is revised it will consist of a first part containing general clauses covering definitions, test conditions, etc., followed by a loose-leaf part, each leaf dealing with a particular type of cell. In this way it will be easier to revise or extend the document to keep pace with developments and new uses for cells.

Technical Committee No. 37, Lightning Arrestors. The main committee did not meet, but an Experts Committee continued its work on the preparation of a specification for expulsion-type arrestors. The Secretariat now has the necessary details to enable a new draft to be prepared and circulated to the national committees for comment. It is hoped that a meeting of the main committee can be held in about a year's time.

Technical Committee No. 38, Instrument Transformers. This committee is dealing with the revision of Publication 44, Instrument Transformers, and at its meeting in Stockholm the section dealing with current transformers for measuring purposes was completed to the stage where the Secretariat (the B.S.I.) can prepare a new draft for circulation for comment.

The committee will now turn its attention to current transformers for protective purposes, after which the way will be clear for the consideration of the drafts already prepared by the Secretariat for voltage transformers.

The question arose whether capacitor voltage transformers should be dealt with by this committee or by the committee on power capacitors, and after consultation with the chairman of the latter committee it was agreed that TC/38 should get on with the job.

Technical Committee No. 39, Electronic Tubes and Valves, and Similar Semi-conductor Devices. This committee, and its sub-committee on tubes and valves, met in Stockholm, and its sub-committee on semi-conductors met in Vasteras. A joint meeting of the main committee and of TC/40 (see below) was held in Stockholm, to deal with sockets and accessories for tubes and valves. The outcome of these meetings is that a document (based on some American proposals) giving definitions of rating and rating systems for electronic devices will be circulated under the six months' rule. In casting their votes the National Committees will be asked to say whether the proposals are, in their view, applicable to semi-conductor devices as well as to valves and tubes. A similar stage was reached on a draft specification for valve sockets.

Technical Committee No. 40, Components for Electronic Equipment. Five sub-committees held meetings in addition to the meeting of the main committee and the joint meeting with TC/39. As a result of all this activity a large batch of documents was agreed for circulation under the six months' rule, comprising the following subjects (in addition to those mentioned above under TC/39):—

Dimensioning of wiring jigs and pin straighteners.

A supplement to the specification for general-purpose aluminium electrolytic capacitors.

A supplement to I.E.C. Publication 96, Part 1, dealing with general requirements and measuring methods for radio-frequency cables.

Revised edition of Publication 78, Standard impedances and diameters of radio-frequency cables.

Connectors for frequencies below 3 Mc/s.

Rotary wafer switches.

Toggle switches.

Vibration testing of components.

Ferromagnetic oxide materials.

The I.E.C. publication on the climatic and durability testing of electronic components (Publication 68) is under revision, and some of the tests have now been agreed for publication. Other tests will be circulated in an amended form under the two months' procedure. It is proposed that the new edition of Publication 68 shall be issued in loose-leaf form so that the various tests can be more readily replaced on revision and new tests added.

Technical Committee No. 40 was, some two years ago, given the task of making recommendations on the standard temperature and humidity conditions to be adopted for the testing of materials. These recommendations were to be as far as possible of general application and not confined to the testing of electronic components. The work was entrusted to a sub-committee and a document was circulated last year to the National Committees for comment. The comments received were considered by the sub-committee in Stockholm, with the result that the main committee endorsed a revised document for submission to the Committee of Action. The recommendations in this document are consistent with the recommendations made by the I.S.O. committee on the same subject. When this document came before the Committee of Action some differences of opinion arose on whether the document should eventually be issued as an I.E.C. publication or whether it should be regarded as an internal document for the guidance of all technical committees concerned with the testing of materials. The Committee of Action referred the matter to the President's Preparatory Committee for guidance.

Technical Committee No. 42, High-Voltage Testing Techniques. This committee has produced a document on the measurement of voltage by means of sphere gaps. This is a revision of an I.E.C. publication which was issued several years ago, and is the result of calibration tests made in various laboratories during the past few years. The new document is closely in agreement with B.S. 358, and has now reached the stage where it can be circulated under the six months' rule.

A document dealing with high-voltage measurements other than by the use of sphere gaps was also discussed, but a further meeting will be necessary before an agreed draft becomes available.

Technical Visits and Social Functions

As usual, a full programme of technical visits and social events was interspersed with the meetings of technical committees. In Copenhagen a reception and a dinner were given by the Danish Electrotechnical Committee and technical visits were arranged to Hellesens dry cell factory and to the Northern Cable & Wire Works. In Ludvika dinners were given by ASEA and by the Stora Kopparbergs Berslags AB, a leading Swedish mining and paper company founded in the 13th century. In Vasteras a dinner was given by ASEA, and during an excursion a visit was paid to the Swedish Army Riding School.

In Stockholm a reception was held at the City Hall by the city of Stockholm, and the City Hall was also the scene of a banquet given by the Swedish Electrotechnical Committee in collaboration with the Swedish Electrical Manufacturers' Association. There was also an opera performance at the Drottningholm Court Theatre.

The technical visits in Stockholm included the research reactor at the works of AB Atomenergi, a company owned partly by the State and partly by private industry and power companies. Visits were also made to the Bureau for Testing Electrical Equipment (SEMKO); a 380 kV substation at Enkoping; the Stockholm Underground Railway; the AGA factory; the Ericsson Telephone Works; and, of course, various ASEA factories. A full programme of events was organised for the ladies.

Charles le Maistre Memorial Lecture

It will be recalled that the Charles le Maistre Memorial Lecture was instituted in 1953 to perpetuate the memory of the outstanding services given to the I.E.C. by le Maistre in the course of the 49 years during which he held office as general secretary, and at the same time to contribute to the progress of international electrical standardisation through the activities of the I.E.C. The lecture given in Stockholm this year was the fourth in the series and was delivered by Prof. R. Vieweg, president of the Physikalisch-Technische Bundesanstalt at Brunswick, and chairman of the German National Committee of the I.E.C. He took as his title "Measuring – Standardising – Producing," and he introduced the subject by pointing out that measuring a magnitude means representing it by a number which shows how often the unit concerned is contained in the magnitude to be measured. The magnitude and unit must therefore be of the same sort. In the modern sense measuring means exact comparison. The superiority of electrical methods in making many technical measurements lies in their easy adaptation to given ranges, in their great resolving power and in convenient transmission over long distances. Other advantages are the recording, counting and summation of the results of measurement.

The time is long past, said Dr. Vieweg, when skilled mechanics made measuring instruments one by one; industrialisation has come to the aid of craftsmen. Factories for measuring equipment have been erected and form a considerable group within the industrial economy. Yesterday's outstanding achievement in instrument construction is to-day's routine instrument. Even countries which have not previously been interested in technical development and industrialisation are to-day striving to set up measuring institutions as nuclei of scientific and technical research and of progress.

We measure in order to enlarge human knowledge, we standardise to augment technical order, we manufacture to make more goods available to people. From this we are led to the conclusion that "Technology is the effort to avoid effort." Even though this maxim does not sum up the full content of technical activity, nor does it suit all requirements of free initiative in using nature for human service, standardisation is, nevertheless, surely covered. We standardise in order to simplify work.

Dr. Vieweg concluded with these words: "The critics of the method of standardisation should take leisure to study the character of our work, or listen to the meetings of some technical committees of the I.E.C. They would probably be astonished to see how much clear thinking and goodwill they found. They might well come to the conclusion that standardisation, together with the work of the International Electrotechnical Commission, carried out in the spirit of Charles le Maistre, can perfectly be identified with the aims of technology, as stated by Ortega y Gasset, 'It is the mission of technology to give Man the liberty to be human.'"

VIEWS on the NEWS

By REFLECTOR

ONE has to be very careful in the choice of words, for whatever is in one's mind can be completely misinterpreted if the phrasing is at all loose. For instance, it has been pointed out to me that in the leaderette on "Accidents in the Home" in last week's *Electrical Review* it was stated:—"A substantial reduction could surely be achieved if there was a greater awareness of the dangers involved in the use of electricity." What the writer meant to imply, of course, was that there were dangers in the *improper* use of electricity. The fact that electricity is not dangerous is quite evident from the minute proportion of users who sustain injuries. Electrical accidents are probably the least in the list of accidents in the home. Carelessness in use is only one cause of electrical accidents; most arise from faulty installations and if compliance with the I.E.E. Wiring Regulations were always insisted upon there would be even less trouble than there is at present. In this direction I expect the National Inspection Council for Electrical Installation Contracting to exercise increasing influence.

* * *

Coroners when conducting inquests into electrical fatalities usually give a warning of the dangers inherent in "amateur" wiring. There was a case last week in which an "amateur" had installed what was called "the wrong kind of flex" and had inserted a switch in the neutral. Therefore it was hardly wise of the coroner to say that he did not wish to criticise the man who did the job because he had only done "what I [the coroner] and other amateurs have done." But he followed this with a statement that as a result of recent inquests he now had his work checked by a professional electrician.

* * *

Electric drills used in the home are not very large consumers of electricity, but one of them recently sent up the bill. The *Peterborough Standard* reports that following the receipt of a very heavy account by a couple living in North Hunts a thorough investigation was made. The last place to be tried was the attic. There they found an electric drill running; it had been running since it was used three months earlier. This, incidentally, was a good life test for the drill for it must have represented a few years of actual use.

* * *

Good "public relations" are recognised as essential both by commercial concerns and public boards. Great patience and understanding are the main attributes of a good public relations department; fools must be gladly suffered when necessary and their complaints must be seriously considered. Sometimes staff dealing with the public are badly strained, especially when there are stoppages of the supply and maybe hundreds of irate consumers keep the staff busy on the telephone. Nevertheless, such complaints should be carefully handled. A prolonged breakdown caused a good deal of trouble recently, but when inquiries were made of the Electricity Board they were met in a light-hearted and irresponsible way, according to a parish council, which instructed its clerk to protest. On the other hand, a letter to the *Dartford Chronicle* complaining about the poor quality of the electricity supply in the Wilmington area brought the writer a most courteous letter from the District manager in which he explained the circumstances and described the way in which an improvement was being made. Who can doubt that this method of treatment is more likely to do good to the electrical cause than an indifferent or even offensive response.

* * *

In its latest report the Committee of Public Accounts criticises the Post Office for charging a sum of 5 per cent for managing the Premium Bonds scheme. The Committee was told that this departure from accepted practice arose from the G.P.O.'s reluctance to operate the scheme at all. For one thing the development and construction of "Ernie," the equipment which selects the bonds for prizes, is said to have delayed work on the development of electronic telephone exchanges. If this is true, as no doubt it is, I consider it a great pity that telephonic advance should have been interfered with by what is largely a "stunt." No doubt many other unsuccessful bond holders will agree with me in this.

* * *

Under the heading "Marvellous," the following appeared in a recent issue of *Tit-Bits*:—

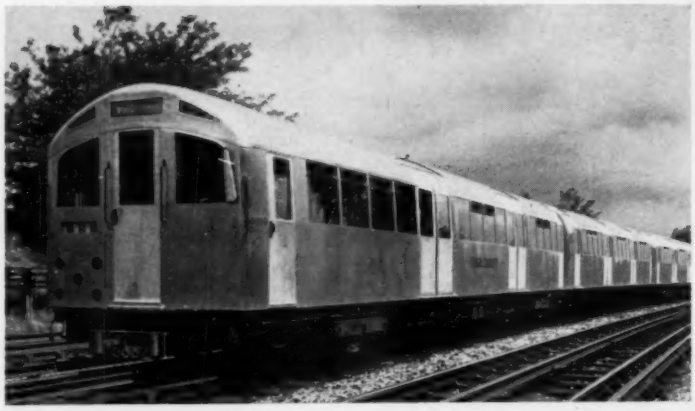
> "Last night I was reading about some of the marvels of electricity, and it certainly made me stop and think. —Eric C., Belfast.
>
> "Editor: Yes, isn't it wonderful what electricity will do!"

* * *

Seventy years ago the London Underground railway system, now acknowledged to be the finest in the world, was in a rudimentary stage. The following note from the *Electrical Review* of 17th August, 1888, is of interest:—

> "At a meeting of the shareholders of the City of London & Southwark Subway Company, held at Winchester House on Tuesday, the directors were authorised to make arrangements for the working of the line by electricity. The subway, which, when complete, will extend from the City side of London Bridge to the Swan at Stockwell, with several stations between those two points, was originally intended to be worked on the endless-cable principle, which is said to give such satisfactory results in America, but the directors of the company have, after careful investigation, arrived at the conclusion that the line can be more thoroughly, efficiently and economically worked by electricity. Several eminent firms have, they say, expressed their readiness to undertake the work, the system which they propose to adopt being that of continuous conductors, and are so sanguine of success that they have offered to work the line on favourable terms for a number of years."

NEW LONDON TRANSPORT ROLLING STOCK



Prototype 7-car tube train with aluminium alloy panelling supplied by the Metropolitan Cammell Carriage & Wagon Co. Ltd., to London Transport in 1957

To improve the service on the London Underground the British Transport Commission has approved the placing of orders by London Transport for 76 seven-car trains for the Piccadilly Line at a cost of £10,120,000. This will enable all the rolling stock on this line to be replaced except for the 15 modern trains now in service and the three prototype "silver" trains which have been running for some months.

The main orders—the biggest for Underground trains since the war—have been placed with the contractors and the new trains will be delivered between the autumn of next year and mid-1962. The order placed with the Metropolitan Cammell Carriage & Wagon Co. for the bodies and bogies of the 532 cars is valued at nearly £5½ million. The other contractors are the British Thomson-Houston Co., Ltd. (380 camshaft traction control equipments and auxiliary equipment); General Electric Co., Ltd. (760 traction motors with a continuous rating of 850 h.p. at 66 per cent field); Westinghouse Brake & Signal Co., Ltd. (brake equipment); Metropolitan-Vickers Electrical Co., Ltd. (motor generators); G. D. Peters & Co., Ltd. (door equipment); Associated Equipment Co., Ltd. (automatic couplers and disconnecting units); Hoffmann Manufacturing Co., Ltd. (roller bearing axle boxes and suspension bearings); Clifford Snell, Ltd. (loudspeakers); Peto & Radford, Ltd. (batteries); Patent Lighting Co., Ltd. (auxiliary lighting equipment); the Benjamin Electric, Ltd. (lighting and auxiliary equipment).

Like the prototypes now running, the new trains will have all-silver aluminium exterior panelling, which will save both weight and about one ton of paint per train. They will also have rubber bogie-bolster and axle-box suspension, with the object of reducing maintenance expenditure and giving the passengers a smoother ride; fluorescent lighting, which will also illuminate the train number plate cabinet and a roller blind destination indicator above the centre cab doorway; and a 15 per cent increase in passenger capacity obtained by placing the control equipment under the floor.

Other features incorporated after trial on the prototype cars are improved retractable shoegear; and a modified electro-pneumatic brake system designed to facilitate maintenance and to improve reliability. A new type of motor generator, incorporating a separate alternator to feed the fluorescent lighting circuits, has been designed to eliminate the undesirable noise associated with the machines fitted on the prototype trains.

A further order is to be placed shortly for twelve prototype motor-cars for the Central Line. They will have underfloor equipment, each bogie having two motored axles, and they will be used with twelve rebuilt trailer cars to make up eight-car trains to determine the most satisfactory form of car and equipment for this service. If the trials are successful it is intended to equip the Central Line with further similar trains, so reducing the number of new cars to be built. When the new Piccadilly Line trains are delivered some of the present Piccadilly Line stock will be transferred to increase the length of all Central Line trains to eight cars.

The present orders are additional to those placed earlier this year for the London Transport Metropolitan and District Lines and bring the total number of cars ordered to 805 at a cost of over £16 million.

Railway Modernisation Progress

THE electrification of the Colchester-Clacton-Walton lines is being carried out on the high voltage a.c. system which in due course is to be extended to all Eastern Region electrified lines, and the immediate purpose of the scheme is to investigate the characteristics and performance of much equipment not hitherto employed on British Railways. This "testing ground" will later be linked with extensions of the main line electrification from Chelmsford to Colchester and, subsequently, from Colchester to Ipswich.

The considerable civil engineering work necessitated by the electrification programme is now practically complete and the electrical engineering work continues to make excellent progress. All the foundations for the structures carrying the overhead wires are now in and almost all the structures themselves are in position. An interesting feature of the wiring technique is the use being made of a specially designed rail-mounted, hinged platform for fixing the cantilever assemblies just before wiring. This device has been developed by the contractors, the British Insulated Callender's Construction Co., Ltd. Some 70 per cent of the wiring has been erected and of this about a quarter has been finally adjusted.

The provision of rolling stock for the Colchester-Clacton-Walton service is now in hand, each four-car set consisting of a driving trailer-coach, a motor-coach carrying the pantograph, a trailer composite coach and a second driving trailer-coach. This particular stock is intended for eventual use on the London, Tilbury and Southend line when that is electrified and 112 complete four-car units are on order, some being built in railway workshops at York and some at Doncaster. All the electrical equipment is being supplied by the English Electric Co., Ltd. The maximum speed of the stock is 75 m.p.h.

£5 Million Contract from Victoria

The State Electricity Commission of Victoria, Australia, has awarded a contract valued at more than £5 million to Babcock & Wilcox of Australia, a subsidiary of the British company. Over a fifth of the work will be carried out in the United Kingdom works of Babcock & Wilcox. The contract is for boiler plant for the extension of the Yallourn power plant, work on which will begin in October.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Professional Engineers' Conditions

YOUR leading article in the issue of 15th August gives welcome attention to the problems which face the professional engineer whose conditions of service are determined through a system of collective bargaining. There are, however, one or two points I would like to make about the report on this subject which has recently been adopted and published by my Council.

The report describes the development and present structure of collective bargaining machinery, and examines the advantages and disadvantages to which the system is subject. The report observes that " the arguments in support of collective bargaining for the professional engineer are mainly practical, the arguments against it are mainly ethical," and it is through an examination of these basic issues of professional ethics that my Council has concluded that collective bargaining machinery is inconsistent with the professional standing of the engineer. It follows that it is the inappropriateness of such machinery, rather than the impossibility of adapting it to deal separately with professional engineers, which is the basis of the conclusions reached in the report, and that the resulting change in the policy of the Guild is one of principle and not of tactics.

In its report, my Council has tried to set down the facts and then to state its conclusions, and if the report at least encourages professional engineers to think constructively about their position it will have served a useful purpose. For this reason we shall be pleased to supply copies to any who would like to read it in full.

78, Buckingham Gate, London, S.W.1.

J. G. ORR, *Secretary,* Engineers' Guild.

Smoking at Brussels

SMOKING (especially of Belgian cigars !) in the British Government Pavilion would be quite inappropriate in view of the nature of the display and the ban seems to me to be reasonable.

If our exhibit is not getting a full share of visitors, it is because it is so far from the centre of things. It is hardly likely to be found by chance, and as an advertising man I would have been very sorry to have had to accept the site.

However, ten per cent of millions is not negligible, and the visitors (of all nationalities) who do find their way into the British Government Pavilion seem to be most impressed.

St. Leonards, Sussex. T. J. BARFIELD.

Inadequate Wiring Systems

THE Chief Executive and Secretary of the National Inspection Council for Electrical Installation Contracting draws attention to the necessity for quality in an installation, but may I point out that his organisation has no control whatsoever over that section wherein cheap, shoddy materials and amateur workmanship are most likely to appear. I refer, of course, to the final connection from plug to appliance. What more reason, then, for ensuring that an adequate number of well-sited socket-outlets keep these flexes as short and simple as possible ?

Mr. Thacker draws attention to the New Day socket, but multiple sockets only lead to a conglomeration of flexes. In this area is a recently built housing estate in which the installations comprise one New Day socket per room. What advice would Mr. Thacker give to a new house owner who wishes to fix up his radio in the corner of the room diagonally opposite the socket and his standard lamp on the side of the fireplace remote from the socket, and what in the opinion of the N.I.C.E.I.C. is the correct procedure for one of their approved contractors who, having supplied these articles, is called upon to install them in the positions indicated ?

Maidenhead, Berks. B. RAYNOR.

MY letter in your issue of 8th August was never intended to include instructions for a " do-it-yourself " kit. Mr. B. employed a competent contractor who kept to the Wiring Regulations (his copy was cloth-bound) and as the house was large there were some rings, not " some ring." The contractor (being competent) would have taken it hardly if told that his connecting of an extra socket was " a performance." Mr. Raynor seems surprised that the ring circuits were run round every wall—but why ? It is perfectly practicable and saves a lot of expense in the long run. I had some done like that twelve years ago.

It is only too easy on domestic installations to arrive at a " penny wise pound foolish " result. A large part of the initial cost is for labour and of this much is on non-electrical work, shifting furniture, etc., which has to be repeated if the initial installation is inadequate and extensions are required later. The extra cost of using 7/·029 cable instead of 3/·029 for all sockets in a three-bedroomed house should be under £5 (not much in relation to the value of the house) and any appreciable saving from small sockets appears unlikely unless shutters are omitted.

Mr. Raynor asks for my explanation of why inadequate wiring is still installed when the excellent ring circuit system is available. Really, it beats me; but can it be (this is after all the " silly season ") that the public think ring circuits must be round and so wouldn't fit into their houses ?

Mitcham, Surrey. H. C. COOPER.

Cable for Cap Lamps

A NEW edition of B.S. 937, which was originally published in 1940, provides a specification for a reliable flexible cable for miners' cap lamps. A special design of cable had been developed for the purpose, which was improved in 1947, when a polychloroprene sheath was standardised by amendment to B.S. 937. This new edition retains the essential points of the original standard and introduces test requirements for the various components of the cable. These include physical tests on the rubber insulation, polychloroprene sheath and strain cord, a test for resistance of the sheath to swelling when exposed to organic acids, and fire-resistance tests. Copies of B.S. 937:1958 can be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 4s 6d.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Electricity Council has appointed **Mr. L. A. Corney,** B.Sc.(Eng.), A.M.I.E.E., formerly regional safety officer in the North West, Merseyside and North Wales Area, as deputy chief safety officer. He will be at the Council's London offices, Winsley Street, W.1. Mr. Corney entered the electricity supply industry in 1933 and after five years joined the Factory Department as H.M. Inspector of Factories. He returned to the industry in 1948 upon appointment as regional safety officer.

Mr. D. Hudson, Associate I.E.E., who was assistant regional safety officer in the London, Eastern and South Eastern Area, has been appointed to succeed Mr. Corney as regional safety officer in the North West, Merseyside and North Wales Area. Mr. Hudson has been an assistant regional safety officer for the past five years and before that was technical assistant to the chief safety officer for two years. He entered the electricity supply industry in 1924 and served on the generation side until he joined the Safety Branch seven years ago.

Mr. Stanley F. Steward, who until now has undertaken the dual responsibility of chairman and managing director of Lancashire Dynamo Holdings, Ltd., has relinquished his appointment as chairman. **Lt.-Col. G. S. Marston** has been appointed chairman. Mr. Steward remains managing director but has informed the board that he will not seek to renew his service agreement when it expires next February. **Mr. D. C. Lorkin** has been appointed an additional managing director.

Lt.-Col. G. S. Marston

Colonel Marston has been closely associated with the electrical industry for very many years. In 1920, in partnership with the late Mr. J. G. Statter, he formed J. G. Statter & Co., Ltd., and he is chairman and managing director of that company. He became a director of Lancashire Dynamo Holdings, Ltd., when J. G. Statter & Co., Ltd., joined the Lancashire Dynamo Group in 1956.

Mr. T. Morrison has been appointed instrument sales manager for the United Kingdom to the Solartron Electronic Group, Ltd., and the company's sales areas have been reorganised into three regional groups under **Mr. D. P. Taylor** (South Western region), **Mr. D. R. Hall** (South Eastern) and **Mr. T. Blacklock** (North of England and Scotland).

Mr. O. W. Minshull, B.Sc., M.I.E.E., has been appointed general manager of the Power Cables Division of British Insulated Callender's Cables, Ltd. Mr. Minshull, who was educated at Tettenhall College, Wolverhampton, and at Birmingham University, has been with B.I.C.C. for thirty-two years. Joining the former British Insulated Cables, Ltd., in 1926 as an assistant contracts engineer, he became sales engineer in Birmingham in 1931. An appointment as branch manager at Birmingham in 1940 was followed in 1943 by his becoming assistant sales manager—a position he held for two years with the former B.I. Co., and for three years after the formation of B.I.C.C. in 1945. He was appointed home sales manager of B.I.C.C. in 1948, manager (home sales) in 1950 and general sales manager in 1952. Two years later he became manager (sales co-ordination) and was appointed manager (commercial co-ordination) in 1957. He will remain deputy chairman of the British Insulated Callender's Construction Co., Ltd., and British Insulated Callender's (Submarine Cables), Ltd. Mr. Minshull was recently elected a member of the Supply Section Committee of the Institution of Electrical Engineers.

Mr. O. W. Minshull

Mr. M. F. Jordan, Ph.D., has joined Murex Welding Processes, Ltd., as leader of the fundamental research section of the Research Department. In this capacity he succeeds **Dr. W. D. Biggs,** who has now left the company to take up an appointment in the Engineering Department of Cambridge University. Dr. Jordan graduated in 1951 with an honours degree in industrial metallurgy at Birmingham University and subsequently became a member of the "Joining of Metals" research team at the University. He carried out an investigation of the mechanism of oxide removal from aluminium by brazing fluxes and for this he was awarded his doctorate. Before joining Murex, Dr. Jordan was on the staff of the Aluminium Laboratories, Ltd., Banbury, and worked in the casting section of the company's metallurgy division.

Mr. H. J. Wellard, B.Sc., has also joined the fundamental research team of Murex Welding Processes, Ltd. In 1949 he joined the British Rayon Research Association, Manchester, and up to his present appointment was engaged on investigations by X-ray crystallography of the structures of fibre-forming polymers.

Mr. A. S. Verity, T.D., A.M.I.E.E., A.M.C.T., has been appointed chief electrical engineer at the Manchester office of R. W. Gregory & Partners, consulting engineers. Mr. Verity has had wide experience in industrial electrification, covering design, manufacture, installation and operation, and until recently was with the North Western Electricity Board as section head in the No. 1 Sub-Area headquarters where he was responsible for industrial and large commercial consumer matters.

Mr. P. E. M. Sharp, A.C.G.I., B.Sc.(Eng.), A.M.I.E.E., has been awarded a Ford Foundation travel grant to the United States. Mr. Sharp is personal assistant to Mr. A. H. Young, joint managing director of Troughton & Young, Ltd.; he will be spending two months in the United States in the spring of 1959 and is hoping to visit many of the leading electrical companies, industrial design schools, and industrial designers during his tour.

Mr. P. E. M. Sharp

Many friends and colleagues attended a farewell presentation to **Mr. W. A. Lishman** upon his retirement from the position of chief buyer for W. T. Henley's Telegraph Works Co., Ltd. Sir Alexander Sim (chairman of the company) made the presentation

Sir Alexander Sim presenting a farewell gift to Mr. W. A. Lishman on his retirement from Henley's

which took place at the company's offices at Milton Court, Dorking. Among those present were Dr. P. Dunsheath, Mr. F. W. M. Anderson (directors), Mr. E. J. Vidler (director and general manager), and Mr. S. J. Beaney (director and secretary). Mr. Beaney, in a brief introductory speech, and Mr. Vidler, paid tribute to Mr. Lishman's fifty-one years' service with the company. Mr. Lishman suitably replied. **Mr. L. H. J. Rivett** succeeds him as chief buyer.

Mr. John Penfold is the manager of a new Standard Furnace Division set up by Birlec, Ltd., to handle orders for "standard" furnaces, i.e., those most suitable for toolroom work and general heat-treatment processes. Hitherto these had been dealt with by the company's Heating Division.

Mr. J. Penfold

Mr. A. H. W. Beck, B.Sc.(Eng.), A.M.I.E.E., has recently been appointed to a university lectureship in engineering in the University of Cambridge. Mr. Beck joined the research staff of Standard Telephones & Cables, Ltd., in 1947 and was transferred to Standard Telecommunications Laboratories, Ltd., in 1955, where he was head of the Vacuum Physics Division.

The Stores Department of the Southern Region of British Railways has been re-named Supplies and Contracts Department and **Mr. R. L. P. Cobb,** the stores superintendent, has become supplies and contracts manager.

Mr. Bernard F. Kane, O.B.E., B.Sc.(Eng.), M.I.E.E., has been appointed sales and technical representative in Eastern Europe of Marconi's Wireless Telegraph Co., Ltd., and has relinquished his position as deputy chief of sales, radar division, to take over this newly-created post. Operating from his headquarters in Vienna, he will cover the areas of West and East Germany, Poland, Czechoslovakia, Austria, Hungary, Bulgaria and Roumania.

Mr. B. F. Kane

Mr. Kane was educated at Churcher's College, Petersfield, and at Faraday House. He completed his training with the Allgemeine Elektricitäts Gesellschaft. In 1930 Mr. Kane joined the Indian Posts and Telegraphs and later, in 1937, the Burma P. & T. a post he held at the time of the entry of Japan into the last war. He subsequently joined Sir Norman Frome in Delhi to organise the construction programme for the defence communications of India. In 1945 he was appointed Director of Signals, British Military Administration in Burma, with the rank of colonel. Later, when this became a civilian department, he continued as its chief engineer. After Burma's independence he became adviser to the Burmese Government on telecommunications.

Mr. Kane joined Marconi's in 1950. After a year spent on VHF research at the company's research laboratories he joined the installation engineering staff of the radar division, and in 1957 was appointed deputy chief of sales in that division.

Mr. R. Bate (left) receiving a tape recorder from Mr. M. J. Smith (technical director, Enfield Cables, Ltd.), on leaving the company

Mr. K. F. Crayford has been appointed sales manager of the Government and industrial valve division of Mullard, Ltd., which embraces the Communications and Industrial Valve Department and the Government Radio Valve Department. He will take charge of sales and marketing activities and will be responsible to Mr. H. St.A. Malleson, head of the division.

Sir Francis Evans, G.B.E., K.C.M.G., and **Mr. L. W. Cole,** B.Com., have been appointed to the board of Dewrance & Co., Ltd., to fill vacancies created by the resignation, at their own request, of **Admiral Sir Cecil Harcourt,** G.B.E., K.C.B., and **Mr. Hector McNeil,** B.E., M.I.Mech.E., M.I.E.E.

We announced in our issue of 8th August that **Mr. R. Bate,** M.I.E.E., was resigning his position as sales director of Enfield Cables, Ltd. He was recently presented with a Philips tape recorder by Mr. M. J. Smith, O.B.E., B.Sc., M.I.E.E., technical director, on behalf of his colleagues in the Enfield home and overseas organisation, and he was also presented with a pair of binoculars and other gifts.

ELECTRICAL WHO'S WHO

The fifth edition of the "Electrical Who's Who" is now available. Its nearly 8,000 entries cover all branches of the electrical industry and profession. Copies are obtainable at 27s 6d (postage 1s 6d) from Electrical Review Publications, Ltd., Dorset House, Stamford Street, London, S.E.1., or from booksellers

Mr. G. G. Morris who was for over thirty years chief transformer draughtsman with the General Electric Co., Ltd., Birmingham, has joined the Woden Transformer Co., Ltd., Bilston, Staffs, in an advisory capacity on mechanical design and development.

Mr. E. J. Welton has joined Thorpe & Thorpe, Ltd., electrical engineers and contractors, as contracts manager.

Mr. J. R. Alexander, previously sales manager at the Leyton works of the London Electric Wire Co. & Smiths, Ltd., has joined the staff at the head office of the company on being appointed European sales manager.

Mr. J. R. Alexander

Mr. S. Field has been appointed chairman of Venesta, Ltd., who make plywood and aluminium foil. He succeeds **Mr. H. Rutherford,** who relinquished the chairmanship on medical advice and in recognition of fifty years' service was created the company's first honorary president.

Mr. J. B. Lee, A.M.I.Mech.E., A.M.I.E.E., has been appointed superintendent of the Portobello generating station of the South of Scotland Electricity Board in succession to **Mr. R. Lott.** Mr. Lee is at present superintendent of Yoker generating station, which appointment he has held since June last year. From 1954 to 1957 he was deputy superintendent at Braehead generating station, Renfrew.

The **Midlands Radio Industry Golfing Society** held its monthly meeting at Little Ashton Golf Club, near Birmingham, on 13th August. The E. K. Cole Cup was won by Mr. A. E. Shinton and Messrs. J. Thomas and P. M. King tied as runners-up. Mr.

Thomas was declared the winner of the tankard after play over the first nine holes. The next meeting will be held at the Copt Heath Golf Club, Birmingham, on 10th September.

Mr. J. W. Horton has been appointed manager of the Canterbury district of Hoover, Ltd.

OBITUARY

Mr. F. A. Langham, who for nine years and until recently was rotating plant sales manager of Crompton Parkinson, Ltd., died on 12th August at the age of fifty. He had been with the company for seventeen years. Mr. Langham was well known in the industry and took a leading part in the affairs of the Association of Dynamo and Motor Manufacturers, being vice-chairman in 1955 and chairman in 1956. His earlier experience was gained with S. G. Leach & Co., Ltd., Klaxon, Ltd., and the A.E.G. Electric Co., Ltd.

The late Mr. F. A. Langham

Mr. C. A. Grover.—The death occurred suddenly on 14th August of Mr. Charles A. Grover, T.D., M.I.E.E., who retired from W. T. Henley's Telegraph Works Co., Ltd., at the end of 1956. He was sixty-eight. Mr. Grover went to Henley's in 1906 but left in 1910 to join the P. & O. Line. He rejoined Henley's in 1914 as electrician at Gravesend Works and was appointed chief assistant in the Research Department in 1919. In 1924 he transferred to the Contract Department in charge of outdoor testing, and he became chief technical assistant in 1937.

He served for some years in the Royal Engineers (T.A.); he reached the rank of lieutenant-colonel and was awarded the Territorial Decoration. He was called up in 1939 but was released in 1940 and rejoined his company. He transferred to the Advertising Department in 1943. Mr. Grover was an authority on cable testing and was joint author of a book on this subject. Mathematics was one of his hobbies and for the past 15 years he had regularly contributed "Problem Circle Page" to Henley's house journal, *Distribution of Electricity*.

Mr. William David Cooke, principal assistant engineer (civil) of the South of Scotland Electricity Board, died at his home in Glasgow on 10th August at the age of forty-nine. Mr. Cooke was educated at Queen's Park Senior Secondary School, Glasgow, and Edinburgh University, where he graduated B.Sc. (Civil). He had held posts with Surrey County Council and with various firms of civil engineers. After a short period with the British Electricity Authority in London, Mr. Cooke joined the South West Scotland Division, which is now administered by the South of Scotland Electricity Board, in 1952. Since then he had worked on several major projects, including the nuclear generating station now under construction at Hunterston.

Mr. Walter N. Mann, A.M.I.H. & V.E., M.Amer.H. & V.E., M.R.S.H., Liveryman of the Worshipful Company of Plumbers and a former director of Panelec (Great Britain), Ltd., died on 9th August at the age of fifty-four. Mr. Mann was one of the pioneers of low temperature radiant warming employing electricity as a heating medium. His experiments in this field culminated in the formation of Electric Panels, Ltd., in 1944. He was the first general manager of this company and later when the name was changed to Panelec (Great Britain), Ltd., he served on the board until his retirement in March this year. After retirement he was retained as heating consultant to the company, a position which he held at the time of his death.

Mr. Albert W. Davies, former works director of Mavor & Coulson, Ltd., died on 12th August. He retired from active work in 1948 but continued in an advisory capacity. The major part of his working career was spent on mining mechanisation work. He joined the company in 1896.

Dr. G. B. Pegram, who died in New Jersey on 14th August at the age of eighty-one, was an eminent physicist and was credited with the establishment of one of the first atomic piles, at Columbia University, in 1941. Later he was appointed a director of the Oak Ridge Institute of Nuclear Physics and he helped to found the Brookhaven National Laboratory. He was a member of the staff of Columbia University for about fifty years.

Professor F. Joliot-Curie, who died in Paris on 14th August at the age of fifty-eight, was a distinguished worker in the field of nuclear physics and at one time was High Commissioner for Atomic Energy for the French Government. He was the husband of Mme. Irène Curie, daughter of the discoverers of radium, who was herself prominent in work on radio-activity.

Mr. J. Forgie.—The death is reported from New York of Mr. James Forgie. He was of Scottish origin and was connected with the construction of the City and South London Railway. He was ninety years of age.

Mr. John Lamb, the designer of the tanker *Auris*, which was the first merchant ship to be powered by a gas turbine, died in a London hospital on 12th August at the age of sixty-seven.

Mr. H. Douglas.—The death is reported, at the age of eighty, of Mr. Hinton Douglas, O.B.E., who was for some time chief financial officer of the former Electricity Commission.

Mr. Guy Campbell.—A memorial service for Mr. Guy Campbell is to be held at St. Columba's Church, Pont Street, London, S.W.1, on Monday, 8th September, at 3 p.m.

Trading Improvement in Sydney

In his report for 1957, Mr. C. E. Ranger, general manager of the Sydney (N.S.W.) County Council electricity undertaking, recalls that at the beginning of the year tariff increases to industrial and commercial consumers came into force. Later the trading position of the Council improved to such an extent, however, that it was possible to reduce the charges to the same consumers in September; in fact the concessions were estimated at £730,000 a year compared with the yield of £600,000 a year from the increases. Total income from all sources in 1957 rose by £2,172,700 to £24,249,800 while expenditure was £1,161,000 higher at £23,631,400. The trading surplus on the year's operations was therefore £618,400. Sales of electricity aggregated 2,016 million kWh, an increase of 5·3 per cent, the average price received per kWh sold being 2·847d (against 2·722d). The number of consumers at 31st December, 1957, was 391,221 (383,344 in 1956).

In conformity with the Electrical and Radio Development Association's campaign, "Live Better Electrically" was the theme of the Council's publicity. The initial promotion of off-peak thermal storage space heating resulted in the connection of 380 heaters having a total loading of 550 kW.

Brief details are given of a number of technical developments introduced during the year, including the following:—Thermoplastic cables for l.v. underground to overhead connections were adopted; a taped 11 kV termination was developed for use with air insulated switchgear; insulating oil with acid inhibiting properties was used by the Council for the first time; d.c. resistivity was confirmed as a valuable guide to oil quality; h.f. induction heating was applied to the rapid melting of compound in large cable end boxes; l.v. mains radio phasing equipment was further developed to permit of direct identification and phase sequence determination of h.v. lines using capacitor-coupled non-contacting detectors; the suitability of nylon as a bearing material for watt-hour meters was investigated; and "Mumetal" cored ring type multi-range metering current transformers, moulded in "Araldite," were designed.

INDUSTRIAL NEWS

Engineering Wages and Hours

At last week's annual conference of the Confederation of Shipbuilding and Engineering Unions the president, Mr. H. G. Brotherton, said that the rise in the minimum rates of pay in the engineering industry had not kept pace with the increase in the cost of living. Even an increase of 6 per cent would do no more than restore the unions to the position in which they were fifteen months ago.

Mr. Brotherton claimed that wages had increased more sharply in other European countries than in Great Britain and more progress had been made in shortening the working week. The average number of hours in the engineering industry was now lower in Germany and Italy than in this country.

"Redundancy" was one of the subjects discussed at the conference. Some speakers appeared to favour the compelling of employers to keep redundant men on if they could not find them other employment but finally it was agreed that where men could not be retained all possible steps should be taken to minimise hardship.

A resolution was passed condemning attempts to "freeze" wages; insisting that workers were entitled to benefit from improved productivity; and supporting the policy of a wage structure for the engineering and shipbuilding industries.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 15th August is deemed to be 186s 6d.

The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figure published on 15th August is 177·7 (1949=100) and 114·6 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 185·5 (1949=100) and 123·5 (1954=100), blast furnaces and iron and steel melting and rolling (40 and 41) 191·1 (1949=100) and 130·2 (1954=100); figures are provisional. The price of $\frac{3}{4}$in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 15th August) is 44d per lb.

Reduction in C.E.G.B. Colliers

Referring to the decision of the Central Electricity Generating Board to reduce its collier fleet (see *Electrical Review*, 15th August, p. 274), the Merchant Navy and Air Line Officers' Association and the National Union of Seamen have made a joint statement deprecating the Board's policy.

The statement remarks upon the possible effect on oil supplies of the instability in the Middle East and upon the unprecedented high stocks of coal which now exist in this country. The general Council of the Trades Union Congress is being asked to approach the Board on the subject and if this is unsuccessful the T.U.C. will be asked to make representations to the Government.

Europe and Imperial Preference

With the object of promoting a "better understanding of the British Commonwealth among European industrial organisations, and by this to help ease the course of negotiations for a Free Trade Area," the Federation of British Industries has published a booklet entitled *The British Commonwealth, Commonwealth Preference, and the Sterling Area* (price 3s).

Written in the first instance for a special committee of the Council of European Industrial Federations which is studying various aspects of the Free Trade Area proposals, the booklet includes a full account of the Imperial Preference system, supported by tables showing the margins of preference guaranteed under the Ottawa Agreements. In addition there are many facts about the Commonwealth, its constitution, population, and trade, and an explanation of the working of the Sterling Area. Although the booklet contains no reference to policy the conclusion to be drawn appears to be that the present system of Imperial Preference is perfectly compatible with fair competition in a European Free Trade Area.

Power Plant for Finland

Three members of the Hawker-Siddeley Group have been awarded a £500,000 contract for free piston and gas turbine power station equipment for Finland. The order was obtained by National Free Piston Power, Ltd., and the equipment will be manufactured by the National Gas & Oil Engine Co., Ltd., and the Brush Electrical Engineering Co., Ltd.

The contract, obtained against strong Continental competition, is for two gas turbo-alternator sets and sixteen free piston gasifiers of 1,000 h.p. each, with all auxiliary equipment.

Low Power Portable Reactor

It was announced by the American Atomic Energy Commission last week that its Argonne low power reactor (Alpr) has begun operating at the testing station at Idaho Falls, Idaho, before commissioning at full load of 3,000 kW. The reactor is the prototype of a nuclear reactor designed to produce electric power and heat at remote military stations. It is described as a "package" plant designed for erection on any type of terrain and with a minimum of on-site construction. The components can be transported easily in cargo planes, as no component weighs more than 20,000 lb.

Nylon Industrial Exhibition

The I.C.I. Plastics Division will be holding three exhibitions in September and October to illustrate the industrial uses of nylon. The first exhibition will be held in the Chamber of Commerce Assembly Room, Birmingham, on 23rd and 24th September, the second at the Angel Hotel, Cardiff, on 14th and 15th October, and the third at the Grand Hotel, Charing Cross, Glasgow, on 29th and 30th October.

The exhibits will include refrigerator, vacuum cleaner and washing machine components, walkie-talkie cases, switch parts, coil formers, and cable covering.

Mobile Electrical Workshop at London Docks

A Morrison "Electricar" mobile electrical workshop designed and built to the requirements of the Port of London Authority is claimed to be a new departure in dock transport. The vehicle is equipped with work benches, bench tools and adequate storage space, and is able to take a fully equipped repair team to the scene of a major breakdown anywhere within the area formed by the Royal Group of three large dock systems. These cover a total water area of 234 acres, and have a lineal quayage of 11 miles.

Ships are loaded and unloaded by electric cranes along the entire quay length and, since the speedy turnround of ships is vital, any breakdown in the many electrical services through-

Mobile electrical workshop operating in the Royal Docks (London) area

out this great area must be rectified with the utmost speed.

The choice of a Morrison "Electricar" (Austin Crompton Parkinson Electric Vehicles, Ltd.) 30 cwt long wheel-base chassis, with its workshop body constructed by F. G. Smith (Motors), Ltd., of Goodmayes, was determined by reasons of running economy, having particular regard to the many stops and starts under the congested traffic conditions prevalent at the Royal Docks. An additional advantage is that the vehicle is both used and maintained by the same department, so that other electrical men are released for planned preventative maintenance work. The Authority has also in operation Morrison "Electricar" mobile canteens.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton	£180 0s 0d
COPPER, H.C. Electro	ton	£208 5s 0d
Fire Refined 99·70%	ton	£207 0s 0d
Fire Refined 99·50%	ton	£206 0s 0d
COPPER Tubes ..	lb	2s 0½d
Sheet	ton	£235 15s 0d
H.C. wire and strip ..	ton	£257 15s 0d
LEAD, English ..	ton	£69 10s 0d
Foreign	ton	£68 0s 0d
MERCURY	flask	£79 0s 0d
TIN, block (English) ..	ton	£730 5s 0d
ZINC, G.O.B. Foreign	ton	£63 5s 0d
BRASS Tubes (solid drawn)	lb	1s 7¾d
Wire	lb	2s 5½d
PHOSPHOR BRONZE Wire	lb	3s 9¾d
PLATINUM	oz	£23 5s 0d
RUBBER, No. 1 R.S.S. spot	lb	23⅜d-23½d

Price Reduction

The British Thomson-Houston Co., Ltd., announces that the prices of its variable speed a.c. commutator motors (Schrage Type CHT), in standard ratings up to 20 h.p., have been reduced by 10 per cent.

Willington Power Station

In the article describing Willington "A" generating station which appeared in our issue of 8th August, 1958, we referred to the fact that the economisers were being supplied by both Senior Economisers, Ltd., and Green's Economisers, Ltd. Our article indicates that both types of economiser are of the steel tube type with "H" gilled sleeves shrunk on. While this is true of the Senior Economisers, those supplied by Green's Economisers, Ltd., are of the Type 8 with cast iron Premier Diamond sleeves shrunk on to steel tubes and arranged in staggered formation.

Plant for Gold Mine Winder

The General Electric Co., Ltd., has received an order from the Anglo-American Corporation of South Africa for electrical plant and equipment valued at £59,000. The order covers the driving motors, control gear and high-voltage switchgear for an a.c. winder to be installed at the President Brand Gold Mine in the Orange Free State. The new winder is designed to raise a maximum fo 230 tons of rock per hour from a depth of 5,600ft and is of the multi-drum Blair type with four ropes and two skips. It is driven by two 6,600 V slipring motors with a combined output of 3,600 h.p. at 600 r.p.m., and the control scheme incorporates facilities for dynamic braking. The mechanical parts of the winder will be built in South Africa.

Railway Electrification Cable Contract

Pirelli-General Cable Works, Ltd., an associate of the General Electric Co., Ltd., has been awarded a contract by British Railways, Southern Region, for the manufacture and supervision of the installation of the bulk of the high-voltage and associated cables for the second phase in stage 1 of the electrification extensions to the Kent Coast. Some 140 miles of 3-core, 0·1 sq in 33 kV oil-filled cable and approximately 140 miles of pilot/supervisory cable are included in the contract. For part of the route, corrugated aluminium sheathing will be employed for the feeder and pilot/supervisory cables. The manufacture of these cables is to begin immediately and the installation is due for completion by mid-September, 1961.

New Italian Cable Research Laboratories

New electrical cable research laboratories have just been opened by Pirelli S.p.A. at Bicocca, Milan. The new research centre brings together under one roof the various laboratories previously maintained by the company in different places. The new laboratories occupy an area of 129,000 sq ft and include among other specialised units, laboratories dealing with research in electrical and mechanical types of cable insulated with impregnated paper, plastics or rubber; telecommunications laboratory; rubber laboratory; and laboratory for research into oil, plastics, paints and metals. Four auxiliary laboratories are connected to the laboratory for physical testing of electrical apparatus, theoretical and statistical studies and commercial study section. The last is concerned particularly with tests of raw materials used in the production of cables. A library forms part of the centre and accommodates some 2,000 books and 4,500 scientific magazines.

Works Visits

On 13th August Mr. J. English, Deputy Minister, Department of Trade and Commerce, Ottawa, inspected the works and new High Voltage Laboratory of Enfield Cables, Ltd., at Brimsdown. He was accompanied round the works by Messrs. G. B. Russell, S. Chaplin and M. J. Smith (technical director), all of Enfield Cables, and Mr. G. Hancock of B.E.A.M.A.

As part of their annual outing some forty members of the North Staffordshire Branch of the Association of Mining Electrical and Mechanical Engineers, with their president, Mr. T. I. Paterson, and accompanied by their ladies, visited the Rugby Works of the British Thomson-Houston Co., Ltd., on 14th August as guests of the A.E.I. heavy plant division. The guests were welcomed on arrival by Mr. H. E. Cox, director and general manager, Rugby Works, following which they visited the fabrication, heavy plant, generator and gear factories, whilst the ladies visited Rugby School.

New A.E.I. Headquarters

Topic, the monthly newspaper of Associated Electrical Industries, Ltd., says that the group's new headquarters, to be known simply as 33, Grosvenor Place, London, S.W.1, is nearing completion. The movement of staff into the new premises is expected to begin at the end of September and should be completed over a period of five week-ends.

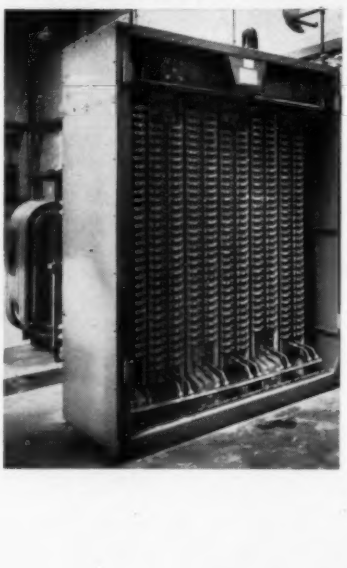
The London offices of the group companies will be at 33, Grosvenor Place but Crown House, Aldwych, will continue to be used by other A.E.I. companies. The moves will enable the leases of eight properties in central London to be disposed of.

It is not the A.E.I.'s policy to tie up money in non-industrial buildings and so the Grosvenor Place building has been sold to the Prudential Assurance Co. in return for a long lease.

Large Germanium Rectifier

A further step forward in the application of Westinghouse germanium rectifiers has been made with the commissioning of a 23,000 A rectifier installation at the works of the

Interior view of rectifier cubicle on site at the Glamorgan Acid & Alkali Co., Ltd. Individual germanium diodes, fuses and the water-cooled busbars can be seen



Glamorgan Acid & Alkali Co. This equipment is used for the electrolysis of brine to produce chlorine which, as hydrochloric acid, is employed in the manufacture of high-grade gelatine. The ultimate capacity of the rectifier is 3 MW. It is water cooled, the cooling circuit being electrically insulated from the d.c. circuit, thereby eliminating the problems which might otherwise result from leakage currents arising from low insulation resistance.

Monitors for Atomic Energy Authority

The United Kingdom Atomic Energy Authority has placed an order with E.M.I. Electronics, Ltd., for hand and clothing monitors. These instruments will be used in research centres, nuclear power stations and laboratories throughout the country.

Southport Flower Show

One of the main attractions of the Southport Flower Show, to be held from 27th to 29th August, will be the giant tomato plants to be shown on the electricity stand. Twelve plants, between 18ft and 20ft in height and yielding an average of 22½ lb of fruit per plant, were exhibited last year and it is stated that this year's exhibit will consist of even bigger plants. The stand has been organised jointly by the Merseyside and North Wales and the North Western Electricity Boards and the Electrical Development Association. The main exhibit takes the form of a growers' house in which the principal emphasis will be on the successful and well-proven methods of tomato propagation and growing.

The advantages of electric bench warming in connection with rooting of cuttings and growing of pot plants will be demonstrated. An enclosed propagating case will show growers how to provide different climates in the same house.

The importance of mist propagation will be emphasised by an exhibit comprising two parts, one allocated to actual propagation and the other to weaning. Another display will be the control of chrysanthemum flowering. A run of heated frames will be divided into three sections, each showing a different application.

Unified Screw Threads

A statement has been issued by Guest, Keen & Nettlefolds (Midlands), Ltd., in which it is said that the use of unified threads for precision bolts and nuts is increasing rapidly. The automobile and petroleum industries and agricultural engineers are all using large quantities and other industries are changing over gradually. For machine screws smaller than ¼in diameter important sections of industry will continue to use the B.A. screw thread but the demand for small machine screws conforming to the American standard and with threads of unified form and pitch is rising and is already about 10 per cent of the total demand. The company goes on to say that "there is no doubt that the unified screw thread has become established as one of the important thread systems in use in this country and it is definitely going to displace Whitworth and B.S.F. in the long run. Unified threads have received support in Scandinavia and Holland and at least one Swedish firm has changed from metric threads to unified inch threads; but on the Continent metric threads will always be first choice and the metric countries are following the example of America, Britain and Canada in unifying their standards, which have hitherto differed from country to country."

At the fourth plenary session of the International Standards Organisation, held in Harrogate and attended by delegations from 38 countries, it was agreed to recommend to the I.S.O. Council that there should be two internationally recognised screw thread systems, the unified inch series of threads and the newly agreed metric series of pitch diameter combinations which is to be adopted by metric countries, though as yet it exists only on paper.

Garcke's Manual

The general arrangement of the 1957-58 edition of "Garcke's Manual of Electricity Supply," which is now available, is similar to that of previous editions. In the General Survey, however, first place is given to the constitution and functions of the Electricity Council. This is followed by a review of the progress of electricity supply in England and Wales and Scotland, a section on nuclear power development, in which are given particulars of the British nuclear power programme, of the various construction groups and of the constitution and functions of the United Kingdom Atomic Energy Authority. The other sections contain particulars of the Central Electricity Generating Board and of its generating stations and similarly of the Area Electricity Boards and of the Scottish and Irish electricity authorities. The directory sections give particulars of manufacturers of electrical and allied plant, a list of associations and institutions, and a directory of executive personnel. The Manual is available from the Electrical Press, Ltd., 19-20, Noel Street, London, W.1, price £4 net.

Diesel-Electric Locomotives

Ten main-line diesel-electric locomotives have been ordered from the North British Locomotive Co., Ltd., for service in the Eastern Region of British Railways. They are intended for freight train working in the London area. The diesel engine in the locomotives is the Paxman pressure-charged 16 cylinder vee type 16YHXL, with a power output of 800 b.h.p. at 1,250 r.p.m. The specific fuel consumption is 0·375 lb per b.h.p.-hour. The main generator is a G.E.C. self-ventilated type WT 881 d.c. machine with a continuous rating of 505 kW 1,700 A at 290 V.

800 h.p. diesel-electric locomotive

"Son et Lumière" at Gloucester

"Golden Legend," the dramatic story of Gloucester Cathedral told against the illuminated background of the Cathedral, opened on 1st August and will continue until 18th September, nightly, except Sundays. The performance is one of the *Son et Lumière* family and is produced by Mr. C. Brewer, who also wrote the script. The electrical installation, carried out by the Strand Electric & Engineering Co., Ltd., uses 150 lighting units and is controlled remotely by a saturable reactor switchboard of standard stage design with fifty-four dimmer ways. The total loading is 108 kW and booster transformers compensate for the reactor volts drop. The sound is by Stagesound (London), Ltd.

Remploy to Distribute Electrical Products

Sole distribution rights for Remploy's electrical products have been relinquished by Foster Electrical Supplies, Ltd. By mutual consent, direct distribution through the trade from 1st September next will be by Remploy, Ltd. (Electrical Appliance Division), Oxgate Lane, Cricklewood, London, N.W.2.

B.B.C. Television Booklet

The B.B.C. has published "B.B.C. Television — A British Engineering Achievement." This is intended for readers who already have some technical knowledge, although not necessarily in the specialised subject of television. A chapter describing briefly how television works is followed by an up-to-date picture of the television facilities which have been built up and are now in use by the Corporation, with a full description of the new Television Centre under construction

near Shepherd's Bush. Other items include a map showing the Corporation's television coverage and advice is given on how to get the best reception of the television service. The effects of various forms of interference are illustrated.

The history of the development of B.B.C. Television since its early beginnings in 1936 is outlined, and an account of the growth of "Eurovision" is supplemented by a map showing the "Eurovision" network. The booklet is fully illustrated, with two pages of colour, and is obtainable from B.B.C. Publications, 35, Marylebone High Street, London, W.1, price 2s 6d post free.

A.E.I. Lamp Works to Close

The lamp works of Associated Electrical Industries, Ltd., at Strand Road, Preston, Lancs, are to close and 320 of 440 employees will be redundant. The remainder will be employed at the company's Fylde Road works in Preston.

The company states that reason for the closure is "rationalisation of manufacture, which has been going on for the past three years." The Strand Road works are to be used only as a lamp store. The process of closing will be spread over six months. There have been meetings of the management, workers' representatives and Ministry of Labour officials in an effort to re-place as many of the workers as possible.

British Electronic Component Show in Sweden

The British Ambassador to Sweden, Sir Robert Hankey, is to open an exhibition of British radio and electronic components which is to be held in the Ostermans Marmorhallar, Stockholm, from 29th September to 3rd October. There will be thirty-two exhibitors. The organisers are the Radio and Electronic Component Manufacturers' Federation, 21, Tothill Street, London, S.W.1 (secretary, Mr. W. T. Ash) to whom application should be made for tickets.

Computer for Belgian Atomic Energy Centre

An electronic computer, claimed to be the most advanced in scope and speed yet produced in Western Europe, has been ordered by the Belgian Atomic Energy Authority. The machine is the high-speed "Mercury" electronic digital computer manufactured by Ferranti, Ltd. The order represents the seventh European atomic centre to standardise on this computer.

Faulty Connection to Drill

An inquest was held at Weston-super-Mare recently on Eric John Pope, of Burnham-on-Sea, who received a fatal shock while using an electric drill. Mr. W. C. Pope, his uncle, said that the drill would normally be connected to a three-pin plug but where this was not possible he had known a lampholder adaptor to be used, with the earth wire pulled well away. Mr. H. Jefferies (South Western Electricity Board) said the drill, cable, and extension connection were all satisfactory, but a bayonet cap adaptor had been connected to the end of the extension. The earthing wire had been cut, and at the end a small portion of bare wire protruded. The adaptor had been affixed so that it was possible for the earth wire to touch either of the other two live connections.

Switches for Street Lighting

The Horstmann Gear Co., Ltd., has received a contract for the supply of 875 type "Y" electrically-wound time switches for the first stage of the street lighting improvement scheme for Kensington.

Control Gear

Referring to the description of the Rogerstone power station in our issue of 25th July, the Watford Electric & Manufacturing Co., Ltd., inform us that the whole of the boiler and turbine 415 V motor auxiliaries control gear was of their manufacture.

Educational

A course for works and plant and production engineers on modern techniques for the engineer will be held at the University of Nottingham on Tuesday evenings, commencing on 21st October. Particulars can be obtained from the Organising Secretary, Engineering Course, 1958, Faculty of Applied Science, University of Nottingham.

Particulars of post-graduate courses in science for the autumn term in Liverpool and district are now available from the Director of Extra-Mural Studies, University of Liverpool, 9, Abercromby Square, Liverpool, 7.

Trade Announcements

To take full advantage of the opportunities offered by the European Free Trade Area for British iron, steel and engineering exports, the **Guest Keen & Nettlefolds** group of companies has set up a central advisory service. The service will also help companies in the group to solve some of the problems of increased foreign competition. The new advisory service will be known as the G.K.N. Group Export Services Organisation (G.E.S.O.) and will operate from Shell Mex House, Strand, W.C.2, under the general direction of Mr. H. W. A. Waring, C.M.G., managing director of Brymbo Steel Works, Ltd.

The headquarters of the electronics group of the **British Thomson-Houston Co., Ltd.,** will be transferred from Rugby to Leicester on 25th August. From 22nd August all communications should be addressed to New Parks Boulevard, Leicester (telephone: Glenfield 531), where the new offices and industrial electronics factory are situated. The following addresses are unchanged:—Military electronics and radar, Blackbird Road, Leicester, and valves and semiconductors, Carholme Road, Lincoln.

Mr. W. E. Bradley and Mr. R. Mountain have been appointed to the Huddersfield and London sales offices of **Brook Motors, Ltd.,** respectively, as sales engineers. Mr. Bradley began as an apprentice with Brook Motors, and served in the Special Control Gear and Customer Contact Departments previous to his appointment. Mr. Mountain also commenced as an apprentice and has spent the last eight years in the Load Testing Department at Huddersfield.

Cawkell Research & Electronics Laboratories, Ltd., has removed to Scotts Road, Southall, Middx. (telephone: Southall 3702 and 5881).

The marine electrical equipment business in the Liverpool area of **Laurence, Scott & Electromotors, Ltd.,** is now being handled from 5, Rumford Place, Liverpool, 3 (telephone: Central 1114). The manager of the Liverpool branch is Mr. F. N. T. Lloyd-Jones.

The Leeds area store of the **A.E.I. Lamp & Lighting Co., Ltd.,** has been moved from Neptune Street to 103, Water Lane, Leeds, 11. The telephone number (Leeds 31541) is unchanged.

Change of Address

The address of the Diesel Engineers' and Users' Association is now 18, London Street, London, E.C.3 (telephone: Royal 2393).

Pressure Cooker Advertisement

We are asked to state that the price of the "Presto Control Master" in the advertisement of the National Pressure Cooker Co., Ltd., in this issue is £2 7s 6d, including purchase tax.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 30th August:

EPIC. No. 776,469. Class 7. Electrical machines for domestic use, and parts.—Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, London, W.C.2.

No. 767,671 (design). Class 9. Electric kettles; and mechanical signs for advertising purposes.—Irish Aluminium Co., Ltd., Nenagh, Co. Tipperary, Republic of Ireland. Address for service, c/o H. D. Fitzpatrick & Co., 3, Gray's Inn Square, London, W.C.1.

ACOSTEREO. No. 775,857. Class 9. Stereophonic radio, television, telegraph and telephonic, indicating and measuring apparatus and instruments, etc.—Cosmocord, Ltd., Eleanor Cross Road, Waltham Cross, Herts.

DARLING DOMESTIC APPLIANCES (design). No. 770,598. Class 11. Domestic electrical appliances and parts.—Turissa (Great Britain), Ltd., 101-109, Ladbroke Grove, London, W.11.

No. 758,859 (design). Class 12. Starting devices for internal combustion engines, electric motors, direction indicators and horns, all for land vehicles, etc. — Robert Bosch G.m.b.H., Germany. Address for service, c/o W. P. Thompson & Co., 12, Church Street, Liverpool, 1.

LAMP MAKING MACHINERY

British Equipment Designed for High-Speed Production

Up to the end of the last war, most of the advanced types of lamp making machinery were imported into this country from the United States. After the war, it was realised in Britain that electric lamp making equipment would have to be radically redesigned in order to keep the price of lamps at a reasonable level, in view of the rising cost of labour and materials.

SOME years ago the Bader Machinery Co., Ltd., Hersham Trading Estate, Hersham, Surrey, introduced incandescent lamp and fluorescent tube making machines, some of which are capable of producing from 2,000 to 3,000 lamps an hour. Such speeds are possible only through the introduction of new automatic loading and unloading devices since the limit of manual operation is about 1,400 indices per hour. This entailed the redesign of existing units, particularly the driving mechanism, and the aim has been to produce fully reliable high-speed precision machinery. As a result, the company has succeeded in exporting its machinery to almost all lamp producing countries of the world including the United States, Scandinavia, France and Germany.

The production of the ordinary household lamp is carried out on a number of machines laid out in the form of a continuous production line. The quality and speed of manufacture are governed by a number of technical and mechanical factors. The reliability of the automatic feeding devices and the time cycle involved in making a glass-to-metal or glass-to-glass seal is extremely important. The number of automatic feeding devices and sealing or fire positions more or less governs the size of the machine. In some cases it was found that only a small increase in " fire power " was necessary when the output of the machine was increased from 1,400 to 2,000 per hour; in other cases as much as 25 per cent increase had to be applied.

On increasing the speed of an obsolete type of machinery it was found that vibration affected the product and appreciably reduced the life of the equipment. On the new type of Bader machines, three-dimensional index cams are fitted, giving constant acceleration and deceleration. These cams engage in hardened and ground steel tapered index rollers located in jig bored index plates. Machining tolerances are held to 0·0002in, and the whole assembly is totally encased and runs in oil. The remaining cams on the cam shaft have been redesigned so that in conjunction with the index cams a steady and constant torque is imparted to the motor. The peripheries of these cams and of the cam followers are hardened to reduce wear at higher speeds. An automatic system is fitted which provides controlled lubrication of all

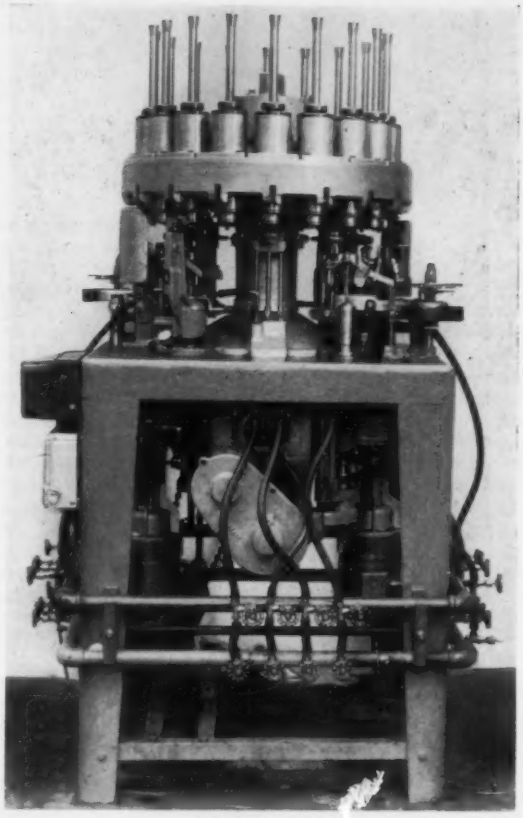


Fig. 2.—Duplex flare making machine

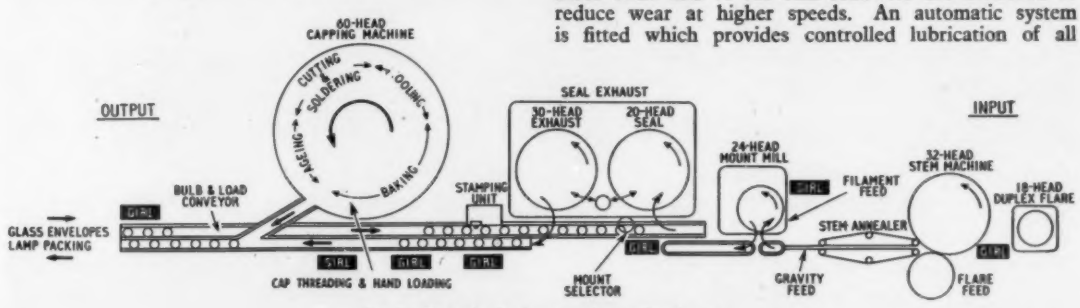


Fig. 1.—Typical g.l.s. lamp production line layout

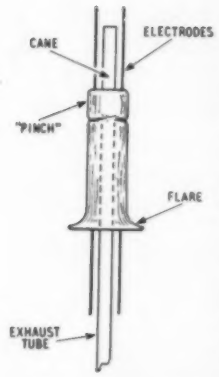


Fig. 3.—Flare assembly

important machine bearings and reduces maintenance.

The layout of a typical lamp production line is shown in Fig. 1. A lamp is assembled from many component parts such as stem or foot, consisting of two electrodes, flare, exhaust tube and cane, glass bulb and cap. The flares are made on an 18-head duplex flare making machine (Fig. 2). The stem, shown in Fig. 3, is made on the 32-head stem making machine, illustrated in Fig. 4. This machine is fitted with automatic cane, flare, electrode and exhaust tube feeds. There are seventeen " fire " positions, two " pinching " positions and automatic unloading into a straight annealer. Each automatic electrode feed is equipped with two sets of pick-up jaws; in the event of one set failing to operate owing to bent electrodes, the other set closes and grips another electrode. The double row burners are hinged and swing out at every index by a cam arrangement, enabling maximum heat to be confined to a predetermined area of the assembly without appreciable heat losses through the machine itself. A motor switch arrangement is incorporated which automatically swings out all the burners clear of the machine when it has stopped. This prevents overheating of the heads. In the event of the cane feed hopper emptying itself or switching off, a " no-feed " device prevents the flare feed from operating. There is also a " no-feed " device which stops electrode feeds when the flare feed hopper is empty or switched off. The completed stems are automatically unloaded into the annealing oven which is equipped with a chain drive. The oven is 5ft long and anneals the stems by indirect gas heating. The annealing process removes all strain from the " pinch."

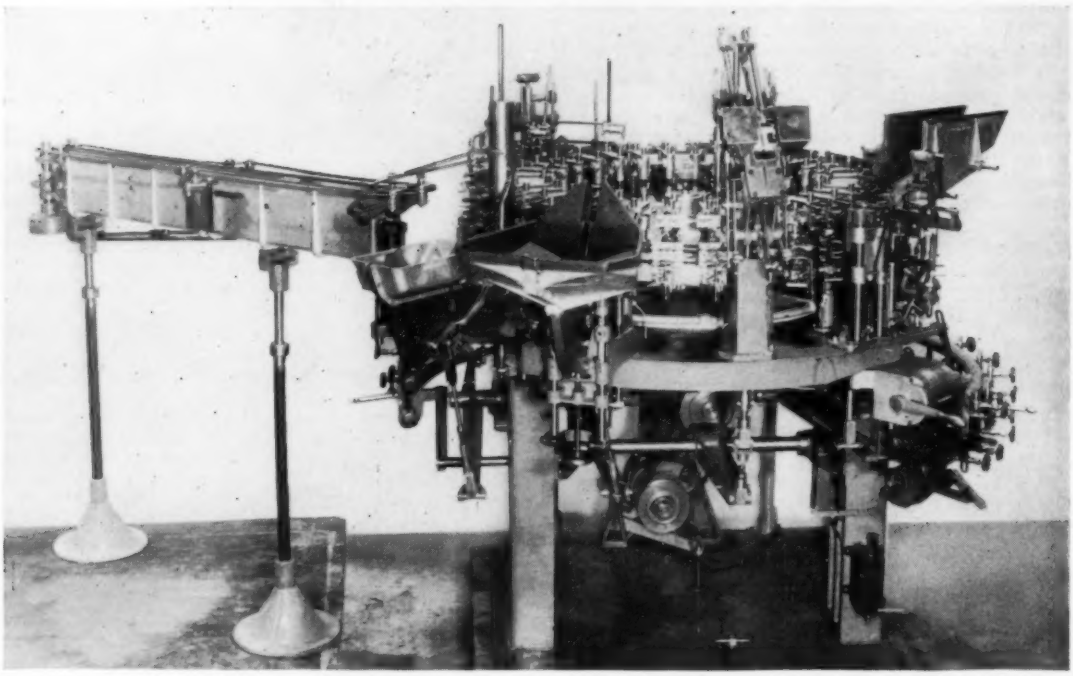
The completed stem is gravity fed to the automatic filament mounting mill selector mechanism shown on the left-hand side of Fig. 5. The mounting mill is equipped with 24 heads and has automatic loading and unloading. It is suitable for the mounting of all types of single- and coiled-coil filaments.

Filament Mounting

After loading, the stems are set for height and the electrodes are set up in the vertical and lateral planes on the first three positions of the machine. In the following two positions the electrodes are flattened and hooked. In the next position the filament pick-up jaws receive the filaments from a tray and present the ends of the filaments into the hooks of the electrodes. The electrodes are then clamped around the filament ends. The electrodes, with the filaments, are pushed inwards at the next position and the assembly passes through five burner positions which soften the end of the cane. The softened end of the cane is formed into a button and the molybdenum support wires are inserted at the following position. The next two positions test the filament clamping and set the electrodes for the following operation which is the curling of the support wires around the filament. In the next two positions the filament is " gettered " and automatically dried. Finally, the filament mounted stem is unloaded into a conveyor which carries it to the sealing and exhaust machine.

The 20-head portion of the sealing and exhaust machine is shown on the right-hand side of Fig. 6 and the 30-head exhaust turret is to be seen on the left-hand side. The mounted stem conveyor is not shown. Part of the bulb conveyor is shown on the left-hand side with the

Fig. 4.—Stem making machine



bulb sealing portion. An automatic unloader feeds the mounted stems into the sealing heads of the machine. The bulbs are then placed over the mounted stem by an automatic vacuum loading device and a centralising method ensures that the neck of the bulb does not damage the mounted stem during the operation. As the machine indexes, the sealing heads start to rotate as they pass through the "fire" positions. The sealing fires mould the bulb to shape and join it to the flare of the mounted stem. The unwanted portion of the bulb is automatically pulled clear of the sealing line. A mechanical mould finally moulds the seal to shape, ready for the next operation. The bulb assembly is automatically transferred via an intermediate turret to the exhaust side of the machine where it is loaded into an exhaust head. The head is then closed in a vacuum-tight manner and passes through a baking oven where it is at the same time alternately flushed with nitrogen and exhausted. This process continues a number of times through the exhaust cycle. After heating, the bulb passes through a cooling cycle to facilitate argon gas filling. Immediately before unloading, the bulb is filled with argon gas to a pressure of 700 mm or over, and the exhaust tube is sealed off and cut.

Capping Process

The assembly is then unloaded into a conveyor which transports it to a machine by which the electrodes are automatically threaded through the lamp caps and the bulb is fed automatically into the capping machine.

The 60-head capping and ageing machine is shown in Fig. 7. The unit layout (Fig. 1) shows three operators on the capping machine, employed in threading the cement-filled caps over the electrodes and loading the lamp manually into the machine. These three operators can be dispensed with once the automatic threading device mentioned above has been incorporated in the unit.

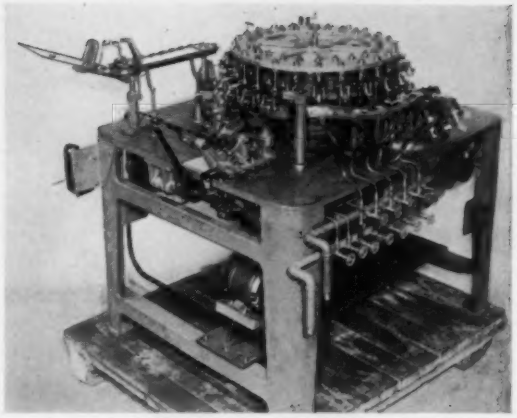


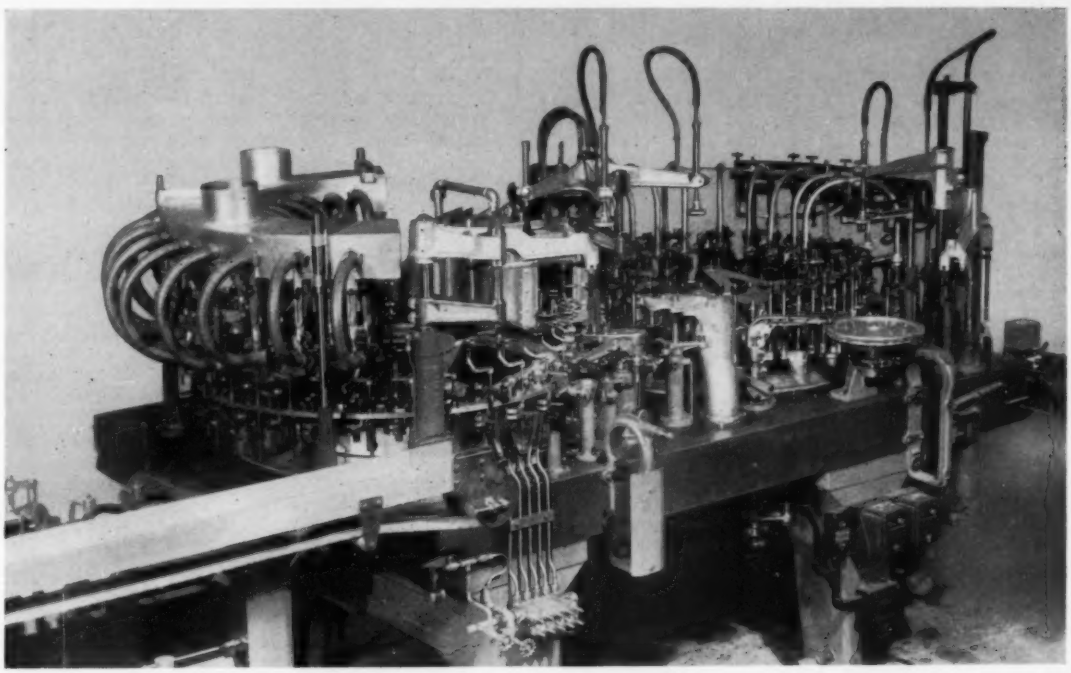
Fig. 5.—Filament mounting mill

While the lamp is passing through the first 30 positions of the machine, the cap is baked to the bulb and the assembly is then cooled. In the following positions the electrodes are cut, fluxed and soldered to the contact plate of the cap and the assembly is then again cooled. The final 14 positions stabilise the tungsten filament by lighting the lamp at a different voltage in each position, the voltage being, as a rule, from 50 per cent rated voltage at the first position to 110 per cent at the final position.

Final Testing

The lamp is unloaded automatically from the capping machine into the packing machine shown in Fig. 8. This machine prints the appropriate voltage on the base board and automatically feeds it on to the packing chain. The

Fig. 6.—Sealing and exhaust machine



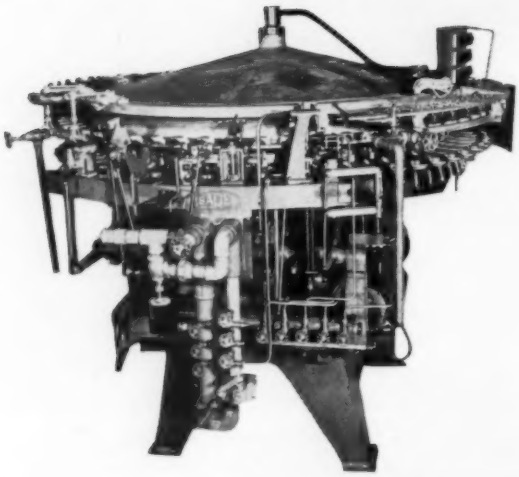


Fig. 7.—Capping and ageing machine

Fig. 8.—Packing machine

lamp is then loaded on the chain and finally electrically tested before being automatically packed into a sleeve. The completed and packed lamp is then passed down a chute where it is cartoned. The Bader Machinery Co., Ltd., also designs and manufactures machinery for the production of radio valves, cathode-ray tubes, diode sealing, transistor assembly, vacuum flask and similar glass working machinery.

EAST-WEST TRADE RESTRICTIONS EASED

Revised List of Goods Subject to Embargo

MOST heavy electrical generating plant and motors are among the many goods now freed for export to the Soviet bloc and China. The reduced list of goods still subject to embargo was published in last week's *Board of Trade Journal* and is effective from 15th August. It was agreed as a result of discussions in the consultative group of 15 countries (all N.A.T.O. countries, apart from Iceland but including Japan) and in Cocom, which is the group's co-ordinating committee. The United States has not, however, modified its policy of not trading with China. Although some time will elapse before the relevant statutory orders can be revised, the Board of Trade will issue export licences immediately. The goods freed from embargo and quantitative control include:—

All electrical generating machinery (other than mobile generators of more than 5 MW); all electrical motors (except those specially designed for submarines); all turbines; spectrographs, spectrometers (other than mass spectrographs and mass spectrometers); X-ray diffraction and electron diffraction equipment; electron microscopes; radio valve making machinery (except certain advanced types and those designed specially for making embargoed types of valves); civilian vehicles and aircraft; compressors and blowers; many types of machine tools; and ships (with certain restrictions on speed).

Under the previous list there was an embargo on the export of generating plant rated at 60 MW and above and on motors of 12,500 h.p. and above and their control equipment; generating plant from 5 to 60 MW and motors from 5,000 to 12,500 and their control equipment were subject to quantitative control.

The new embargo list, like the old one, applies to Albania, Bulgaria, China, Czechoslovakia, Hungary, North Korea, North Vietnam, Poland, Roumania, the Soviet Union, the Soviet Zone of Germany, and Tibet. As far as the electrical industry is concerned it mainly consists of specialised electronic, communication and radar apparatus; scientific instruments, and servo mechanisms; and machines for making such equipment. Among the items added to the list are equipment for the purification and processing of germanium and silicon; electric furnaces specially designed for the recovery of titanium or zirconium from scrap; and apparatus for automatically sorting electronic components in respect of their electrical characteristics.

U.K. ELECTRICAL EXPORTS TO RUSSIA, 1955-57

	1955 £	1956 £	1957 £
Generating sets, complete	956,300	406,100	574,500
Parts of generators	27,400	5,100	19,400
Steam turbines	Nil	28,100	1,700
Water turbines	Nil	5,300	Nil
Electric motors, including parts	Nil	1,200	500
Starting and control gear	200	Nil	3,900
Power transformers	801,800	1,361,200	584,200
Switchgear and switchboards	214,000	19,400	186,800
Welding plant and electrodes	Nil	400	1,000
Domestic electrical equipment	500	1,000	1,000
Commercial instruments, electrical	9,100	3,100	4,600
Scientific instruments, electrical	289,100	114,700	421,900
Electro-medical apparatus	4,100	2,800	200
Wires and cables*	1,224,900	106,300	3,000
Electrical goods and apparatus, unspecified	207,100	355,700	264,700
Total	£3,734,500	£2,410,400	£2,067,400

* Excluding uninsulated copper wire.

THE BACKGROUND TO EAST-WEST TRADE

THE partial severance of trade relations since the war between the East and West has resulted in a large increase in mutual trade among the countries of the Soviet bloc and with China. Between seventy and eighty per cent of Russia's total trade is with her satellites; and at least three-quarters of China's trade is conducted with other Communist countries. Whether the present easing of the embargo and other restrictions on East-West trade will make possible a complete restoration of "normal" trading conditions depends on many factors, not least of which are the enterprise and persistence of electrical manufacturers and exporters—and their ability to re-establish old contacts or to cultivate new ones.

The Eastern markets present special difficulties to United Kingdom exporters since virtually all their trade is conducted by state corporations, and is, therefore, particularly susceptible to political expediency and to changes in economic planning.

Good Prospects in China

Between 1950 and 1956 trade with China was virtually at a standstill. Following the outbreak of war in Korea the United Nations imposed an embargo on the export of strategic goods to China, which covered materials such as rubber and metals, motor vehicles and most types of electrical machinery—even down to vacuum cleaners and hair dryers—and was applied with such rigidity that many manufacturers were not even permitted to supply replacement parts needed to service equipment already installed in China. Trade with Russia and the Soviet bloc, however, came under no direct ban by the United Nations and the countries of Western Europe controlled the export of strategic goods and materials according to the varying needs of their respective defence programmes. For some time the list of goods controlled varied slightly from country to country despite the efforts of the NATO powers to achieve co-ordination. In May, 1957, the Russian and Chinese embargo lists were brought into line; this represented a welcome, if belated, step forward, since it resulted in the removal of the discrimination against trade with China, as compared with Russia.

In 1957 our electrical exports to China rose to about £500,000, the main items being switchgear (£192,000), commercial and scientific instruments (£111,000), and electro-medical and X-ray apparatus (£36,000). This revival appears to be continuing into 1958 and no doubt reflects the relaxations made in the strategic embargo list. It is known that the Chinese Economic and Technical Mission, which visited the United Kingdom in the autumn of last year, placed some substantial orders with British firms and these will appear in the export statistics in due course. The relatively few representatives of electrical manufacturers who have made the journey to China in the last year or two have, without exception, brought back an impression of immense possibilities of business in that country, but it needs to be cultivated by personal contact. As one manufacturer put it: a large proportion of the present generation of electrical engineers in China received their training in England—at Trafford Park, Rugby, Stafford, Witton and other centres—and generally speak some English. When they retire and their places are taken by younger men, trained perhaps in Russia and elsewhere, opportunities for English firms may be severely curtailed.

Until recently it was not easy for British businessmen to visit China, as the Chinese generally would issue visas only to persons who had received specific invitations from Chinese trading corporations. Now, however, visas are being granted quite freely and travellers are finding the state trading corporations ready to discuss the possibilities of future business even though no immediate orders may result.

Electrical manufacturers who have had no previous experience of trading with China would be well advised to seek expert advice from the Sino-British Trade Council, which comprises representatives of the Federation of British Industries, the National Union of Manufacturers, the Association of British Chambers of Commerce and the China Association. The secretary of the S.B.T.C. is Mr. R. D. F. Marlow, at the London Chamber of Commerce, 69, Cannon Street, London, E.C.4.

Difficulties in Russia

Exports of electrical goods and machinery to Russia have in recent years averaged around £2 million annually. In the immediate post-war years the average was only some £300,000 annually so that there has been a substantial increase despite the existence of the strategic embargo list. There has, however, been a falling off in electrical exports during the past eighteen months. An analysis of electrical exports for the last three calendar years shows that generating sets, power transformers, switchgear and instruments have been maintained at a reasonably high level. The fact that the figure for "non-essential" items like domestic appliances is so small is not through want of trying on the part of our own manufacturers but due to the Russians' lack of interest in these goods.

As already indicated, the Russian market presents exceptional difficulties to United Kingdom exporters, one important factor being the virtual impossibility of establishing direct representation in the territory. As a result continuity of contact with the appropriate purchasing authority cannot easily be maintained, and a large degree of uncertainty and a lack of quick returns results. The state corporations conducting overseas trade differ considerably from normal commercial concerns as we know them in this country. Requirements and quantities are calculated in advance and the task of the corporations is merely to purchase the specified goods. The corporation dealing in the purchase of electrical machinery is Machinoimport, located in Moscow, but intending exporters are advised to address their initial inquiries to the Soviet Trade Delegation, 32, Highgate West Hill, London, N.6.

As with China, intending exporters to Russia would be well advised to seek expert advice before they embark on any extensive project. The Russo-British Chamber of Commerce is able to give advice to its members on all aspects of trading conditions and information about Soviet trade organisations. A register of interpreters and qualified typists in the Russian language is also maintained. The address is 2, Lowndes Street, S.W.1.

The London Chamber of Commerce (69, Cannon Street, London, E.C.4) has among its varied interests a section devoted to the promotion of Anglo-Russian trade. An interesting handbook on Anglo-Soviet trade—*A Guide for Prospective Exporters and Importers*—has recently been published by the Russian Section of the Chamber, price 5s, and is available to non-members.

NEW ELECTRICAL EQUIPMENT

Phase and Continuity Indicator

A pocket-sized instrument, which provides visual signals by five neon lamps to indicate the peak voltage sequence in three-phase supply lines and also to identify broken lines, is now being produced by TILTMAN LANGLEY, LTD., Redhill Aerodrome, Surrey.

The whole unit is continuously rated, and three of the lamps are arranged so that if the lines under test are "live" all three lamps light up. In the event of one line being "dead" the lamp associated with that line will light up whilst the others will remain unlit. Provided that all the lines being tested are sound, phase sequence will be shown by one or other of the two remaining lamps lighting up. The phase and line continuity tests do not use the same lamps.

The instrument, which has no moving parts, is fitted with flying leads terminating in insulated clips or interchangeable test probes, complete with stowage compartment, and measures 3in by 2in by 1½in with the electrical parts "potted" in a suitable resin. It weighs only four ounces. The instrument is priced at £5 5s ex-works and caters for three-phase, 115/200 V, 400 c/s a.c. and a similar version for 400 V, 50/60 c/s is also available.

Fibreglass Reflector

A new reflector for use with the company's moulded striplight cable has been developed by D. R. ILLUMINATIONS, LTD., Warren Street, Stockport, Cheshire. The reflector, which is manufactured in fibreglass formed by means of matched metal tooling, can be fixed to either e.s. or b.c. lampholders, quickly and without the use of tools.

Used with "Neoprene" moulded lampholders, these reflectors are suitable for lighting installations in situations where the atmosphere is polluted by chemical fumes, etc.

Fan Heater

A new 2 kW fan heater, the "Solano," has just been placed on the market by BERRY'S ELECTRIC, LTD., Touchbutton House, Newman Street, London, W.1.

Its design is such that when in use a current of warm air flows from the illuminated louvres and is distributed through a wide angle. In summer, with the heater switched off, it can be used to circulate cool air.

The finish is in cream, with silver top, and it measures 11½in high by 15¾in wide by 9¼in deep. Two models are available, one with two-heat control (634) and the other with a built-in "Warm Welcome" time switch (634/W). The respective prices are £11 17s 6d and £14 19s 6d, including purchase tax in the United Kingdom.

Miniature Jack Fittings

A two-pole concentric miniature jack plug (P.519) and jack (J.30) have been introduced by A. F. BULGIN & CO., LTD., Bye Pass Road, Barking, Essex. The plug has axial cable exit, screw-on phenolic cover, plated members and internal solder tags for connections. The jack has phenolic insulation, nickel-silver contact, and tags, one pole being live to the fixing-bush and a third contact is mated with the tip-contact when the plug is removed. It is suitable for the maximum of 1 A at up to 50 V and for a maximum connected load of 10 W.

Vapour-proof Fluorescent Fitting

A vapour-proof fitting has been developed by FELDEN ENGINEERING CO., LTD., Bury Mill, Bury Road, Hemel Hempstead, Herts., for the lighting of plant and equipment where the atmosphere has a high humidity or highly corrosive vapour content. It is also suitable where inflammable dusts or vapours are present but a flameproof certificate is not essential.

The fitting consists of two "Perspex" tubes, sealed at their ends by caps of a synthetic rubber composition and interconnected by spacing bushes of the same material. The fluorescent lamp is carried in the lower tube and supported at both ends by rubber anti-shock buffers. The control gear is in the upper tube.

For some applications a reflector or reflector lamp will be used and mounting should therefore be arranged to allow an adjustment, as may be necessary to obtain maximum light at any level. Some suspensions are available as optional extras, but no particular form of mounting is recommended, since fixing arrangements will vary with the gas or vapour conditions prevailing.

The two-core cable is readily removed by slackening off the vapour-proof gland (two-core cable only is necessary as the fitting is all-insulated and has no external metal parts). The weight of the complete unit is 12 lb.)

Bakelite-encased Bell

A general purpose electric bell which is now in production by ALFRED GRAHAM & CO., LTD., Halifax, is totally insulated with a cover in black, shock-resistant moulded Bakelite. The armature and gong hammer are incorporated in a single pressing. Suitable for use on 24 V, 110 V or 230 V a.c., also on 6 V, 12 V, 24 V and 220 V d.c., the bell has a cable entry to take up to $\frac{17}{32}$in.

Alfred Graham Bakelite-encased bell

The bell is 6in wide and the weight is 3½ lb. The length varies from 8¾in to 11in and the depth from 3in to 4¾in depending on the type of gong employed.

Miniature Relays

A range of a.c. or d.c. miniature relays has been introduced by LONDEX, LTD., Anerley Works, 207, Anerley Road, London, S.E.20. The chassis and armature are constructed from high-grade laminations and the armature has a copper shading ring giving silent a.c. operation. Contact connections are made to solder tags. This type of electro-magnetic unit, series

Left: Berry's Electric 2 kW "Solano" fan heater. Centre: Felden 5ft vapour-proof fluorescent fitting. Right: Londex plug-in miniature relay with four changeover contacts

SM, is used in the four relays of the range. The SMF relay can be supplied with up to 3 make or 3 break or 3 changeover contacts rated at 3 A, 250 V a.c. A mercury switch is employed in the SMQ rated up to 20 A, 250 V a.c. The SMM utilises a micro-switch as the switching medium which is rated at 15 A, 250 V a.c. A totally enclosed plug-in relay, the LOK, also uses the SM electro-magnetic unit and can be supplied with either 2 or 4 changeover contacts rated at 2 A, 250 V a.c. The case dimensions of this relay are 1⅝ by ⅝in in by 2in high.

Soldering Iron

A new heavy-duty electric soldering iron, the "Soldermaster" Type 62M, has been introduced by WOLF ELECTRIC TOOLS, LTD., Pioneer Works, Hanger Lane, London, W.5. The heating element is a permanent part of the copper bit holder and when renewal is needed the complete element and holder assembly is changed. To facilitate this, a split moulded plastic handle is used, with all terminal screws easily accessible. The cadmium plated copper bit is held in position by a retaining nut with a rolled thread of special form.

Besides providing a positive grip this

Wolf "Soldermaster" Type 62M heavy-duty soldering iron

makes for rapid replacement or interchange of the set of three different sized bits. The mild steel solid drawn barrel has a chromium plated finish and is securely fixed into the plastic handle. Specially shaped slots are provided in the barrel to ensure that the temperature of the handle is maintained within comfortable limits.

The "Soldermaster" is 13in long and the net weight is 10 oz. Models for 225/50 V (consumption 75 W) are supplied complete with a set of three bits and 12ft of three-core t.r.s. cable. They are also available for 50 V (50 W) fitted with 9ft of two-core t.r.s. cable. The price, for all voltages, is £2 18s.

Rotary Dry Shaver

The latest addition to the range of dry shavers manufactured by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2, is the "Philishave Jet" (Type 7910) which embodies all the features, including rotary action, of its predecessors, with a number of new ones. The shaving head has 240 additional apertures and the shaving area is thus increased by 40 per cent. The new design also enables the rotating blades to shave even closer, and improved motor performance results, it is claimed, in quieter running and a big reduction in shaving time. Day to day cleaning is made quicker and simpler by the hinged shaving head. The

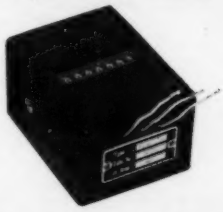
Philips "Philishave Jet" dry shaver

housing is finished in a two-tone colour and, when not in use, the shaving head is protected by a transparent nylon cap.

Streamlined styling allows the shaver to fit snugly into the hand. The shaver operates on two voltage ranges, 110-130, and 200-250 a.c./d.c. It is supplied with a b.c. adaptor plug, in a handsome presentation case of pale grey and gold. The price is £7 3s 6d plus £1 11s 6d purchase tax in the United Kingdom.

Impulse Counter

An electromagnetic impulse counter, manufactured by ELMECO A.G., Zurich, is now available in this country from INGLIS KNIBB & CO., 20-21, Tooks Court, Cursitor Street, London, E.C.4. It can be supplied with mechanical, electromagnetic, or combined mechanical/electromagnetic resetting devices. The Elmeco counter has 5, 6 or 7 figures and is powered by a stepping motor from which the number drums are driven by a plastic belt. The result is a silent machine capable of accurate counting at a sustained rate of 30 impulses per second; this can be



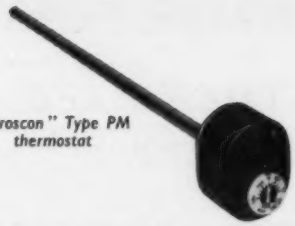
Elmeco impulse counter

increased to 50/60 impulses per second for limited periods, and the operating current is low.

The absence of ratchets gives freedom from wear and tear as well as silent operation, the guaranteed life at 30 impulses per second being 300 million counts. No adjustment or lubrication of the mechanism is necessary and the counters are available for either bench work or panel mounting. Prices vary from £10 3s 4d to £15 11s 6d each.

Thermostat

An addition to their range of "Proscon" thermostats is announced by PROCESS CONTROL GEAR, LTD., Lattimore Road, St. Albans, Herts.



"Proscon" Type PM thermostat

The Type PM conforms to B.S. 1555 and is primarily designed for use with immersion heaters. It is available with 7in, 11in or 18in stem lengths, has an adjustable setting over a range of 90 to 190 deg F and a clear and large scale plate is provided for easy setting.

The instrument is fitted with an anti-friction device which ensures that once having been set to the scale, the setting will not wander. Electrical connections are made by means of pinching screws. The pure silver contacts are rated at 15 A a.c. or 0·1 A d.c. at 250 V.

The thermostat can be supplied with a sealing cap, so that once set, the setting cannot be altered without removing the cap. The sealing cap is transparent and the setting point is always visible. The instruments are priced at 18s 4d for the 7in stem, 19s 4d for the 11in stem and 20s 4d for the 18in stem.

Loudspeaking Telephone

A loudspeaking telephone system which is being distributed in this country by E.M.I. SALES & SERVICE, LTD., Hayes, Middlesex, uses a push-button dial panel on a loudspeaking system capable of 999 extensions. The "Ring-Master" is considerably smaller than the conventional telephone systems.

Simplex and duplex operation of the system is available. In the simplex system conversation is controlled by the person initiating the call. This control is operated by a push-button (press to speak and release to listen). The duplex system eliminates this function so that after connection has been made the conversation may be held freely at both ends without touching either instrument.

The amplifiers ensure a high standard of reproduction and include band limiting filters which enable the equipment to be used in noisy surroundings. It is possible to connect all stations in the system for general announcements by paralleling all speakers and employing a booster amplifier.

"Ring-Master" telephone system

Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets maintained their good form in confident anticipation of last week's further reduction of Bank Rate, after which the normal tendency for investment interest to wane during the height of the holiday season became a little more apparent. In the gilt-edged market the Bank of England decision proved to have been fully discounted in advance of the event, and prices subsequently were merely steady. Industrial shares followed suit; in general they have made a lot of ground during the last month or two, and the market is prepared to see them enter a quieter phase for a time.

Higher Prices

Many more industrial shares lately recorded their best prices of the year. Among them were A.E.I., after a further advance of 1s 3d to 52s 6d, Automatic Telephone, which scored a similar gain to 67s 6d, and Crompton Parkinson, 6d up at 11s. Parsons, Reyrolle and Plessey were showing improvements of half-a-crown or more at the beginning of this week. In the cable group, B.I.C.C. had risen further to 45s (an advance of 2s), while there were gains in the shares of Johnson & Phillips and W. T. Henley's in advance of news about the discussions concerning an agreement between these two companies. Morphy-Richards, British Vacuum Cleaner and other shares connected with domestic appliances remained in favour. Other improvements worthy of note among the many recorded in the accompanying tables were those in Pye, Ward & Goldstone, Brook Motors, Switchgear and Cowans, Babcocks and other heavy engineering shares.

Free of Stamp

New issues of stock present as a rule an opportunity to purchase without the expense of the 2 per cent stamp duty which would normally be payable on the transfer. Recent issues in the electrical market which have at present this material advantage include the Associated Electrical Industries 6 per cent debenture 1978–83 (now £70 per cent paid up), which has been available lately at an all-in price of about 103, and will be transferable free of stamp duty until the first part of next month. Another is the new 6 per cent debenture stock of Pressed Steel, at present £25 per cent paid-up and quoted at 102, including the instalments to come. Also available free of stamp, until the end of this month, are the new Ferranti 5½ per cent third preference shares, the result of a scrip issue. At 17s 6d they offer a yield of 6½ per cent.

Rise in Vactric

Among the biggest price movements of recent weeks has been the rise in Vactric 5s shares from around 15s 6d to 24s. It is attributed to the company's announcement of an agreement to sell its hire-purchase subsidiary, Awley Finance, to Lombard Banking in consideration for £600,000 in cash and a million and fifty Lombard 5s

Price Changes in

Company or Board	Nom. Value	Middle price 18th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1958 Highest	1958 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76½	+½	3	3	3 18 6	76½	72
Brit. Elec. 1974/77	100	72½	+½	3	3	4 2 9	73½	68½
Brit. Elec. 1976/79	100	77½	+½	3½	3½	4 10 3	77½	72
Brit. Elec. 1974/79	100	87½	+½	4½	4½	4 17 3	87½	82½
Overseas Electric Supply								
Calcutta Elec. ...	£1	16/6	+6d	6†	6·8†	8 5 0†	16/9	15/-
East African Power	£1	21/-	+2/-	7½	8	7 12 6	21/-	17/6
Nigerian Elec.	£1	12/6		10	10	16 0 0	17/-	12/6
Perak Hydro-Elec.	£1	14/6	+1/-	10	12½	17 4 9	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	12/9	+3d	17½	17½	6 17 3	12/9	9/9
Aerialite	1/-	7/3	+3d	48	51½	7 2 0	7/3	5/1
Allen, W. H.	£1	37/3		10	11	5 18 0	37/3	32/9
Anglo-Portuguese Tel.	£1	27/-	+1/3	8	9	6 13 3	27/3	19/9
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	57/6	53/-
Assoc. Elec. Ord.	£1	52/6	+1/3	15	15	5 14 3	52/6	46/6
Automatic Tel. & El.	£1	67/6	+1/3	17	17	5 0 6	67/6	57/-
Babcock & Wilcox	£1	49/-	+2/-	15	13‡	5 6 0	52/9	41/9
Bakelite	10/-	19/3	+6d	15	15	7 15 9	21/-	17/6
Baldwin, H. J.	2/-	2/6		20	20	16 0 0	3/9	2/6
Berry's Electric	5/-	7/-	+3d	10	10	7 2 9	7/6	5/9
British Aluminium	£1	51/3	+6d	12	12	4 13 9	51/3	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	28/-	+1/-	25	25	4 9 3	28/-	19/6
B.I. Callender's	£1	45/-	+2/-	12½	12½	5 11 0	45/6	38/9
B.I. Callender's 6% Pref. ...	£1	19/-		6	6	6 6 3	20/3	19/-
British Tabulating...	£1	51/3	+9d	9	10	3 18 0	51/3	38/6
British Thermostat	5/-	30/-		25	30	5 0 0	30/-	19/9
British Vac. Cleaner	5/-	6/6	+9d	10	10	7 13 9	6/6	4/6
Brook Motors	10/-	39/6	+9d	25	25	6 6 6	39/6	33/3
Bulgin, A. F.	1/-	5/3		40	45	8 11 6	5/6	4/7
Bulpitts	5/-	7/9		—	12½‡	8 1 3	7/9	7/3
Burco Dean	5/-	9/3	+9d	20	22½	8 2 3*	9/6	7/9
Cable & Wireless: Ord.	5/-	10/9	+9d	10	10‡*	4 13 0	10/9	8/-
4% Loan	100	93½		4	4	4 5 6	94½	89
Chloride El. Storage "A" ...	£1	59/6	+9d	17½	17½	5 17 9	62/-	55/6
Clarke Chapman	£1	58/9		27½	27½	4 13 6*	72/6	55/-
Cole, E. K....	5/-	15/9	+6d	17½	17½	5 11 0	18/-	15/3
Cossor, A. C.	5/-	5/9		Nil	2½	2 3 6	5/9	4/4
Crabtree	10/-	28/6		20	20	7 0 3	28/6	24/4
Crompton Parkinson Ord. ...	5/-	11/-	+6d	16	16	4 16 9*	11/-	8/3
De La Rue	10/-	23/9	+3d	35	17½*	7 7 3	26/3	20/9
Decca "A"	4/-	25/9	+6d	43½	43½	6 16 0	27/6	21/3
Desoutter	5/-	16/6		32½	18½*	5 13 9	16/6	13/6
Dewhurst	2/-	8/-	+3d	16½	20	5 0 0	8/-	6/9
Dictograph Tel.	2/-	6/9	+3d	20	20*	5 18 6	6/9	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	8/3		25	25	7 11 6*	9/4	7/9
E.M.I.	10/-	38/6	−1/-	15	15	3 18 0	39/6	27/6
Electrical Components	5/-	8/-		12½	12½	7 16 3	8/-	7/-
Elec. Construction	£1	23/9		8½	8½	7 3 3	25/-	21/-
Elliott-Automation	5/-	15/-		—	10‡	3 6 9	15/-	11/6
Enfield Cable Ord.	£1	14/-		Nil	2½	3 11 6	17/-	10/9
English Electric	£1	56/3	+6d	14	14	4 19 6	56/3	44/-
English Electric 3½% Pref. ...	£1	12/6	+6d	3½	3½	6 0 0	12/6	11/9
Ericsson Tel.	5/-	22/3	+1/3	22†	12*†	2 14 0†	22/3	17/6
Ever Ready	5/-	19/-	+6d	37½	20*	5 5 3	19/3	13/9
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	38/9	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

shares, which are worth about £1 each in the market. At the annual meeting last week the chairman, Mr. W. C. Pegley, said that the board was considering a distribution of the Lombard shares to Vactric shareholders. He was also reported as estimating that even without the Awley subsidiary, Vactric's earnings in the current year should not be less than the figures for 1957–58. In that period the company made a net profit of £159,000, representing earnings of 57 per cent gross on the ordinary capital. On the dividend of the 25 per cent shares are showing a yield of 5¼ per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 18th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	35/6	+6d	12½	10	5 12 9	38/9	29/3
G.E.C. 6½% Pref.	£1	21/-	+9d	6½	6½	6 3 9	21/3	20/3
General Cables	5/-	9/3	−6d	30	24	—	11/9	9/3
Greenwood & Batley	£1	48/3		17½	20	8 5 9	48/3	45/-
Hackbridge Holdings	5/-	13/9	+6d	20	20	7 5 6	14/3	7/6
Hackbridge & Hewittic	5/-	12/3	+9d	20	20	8 3 3	12/3	9/7
Head Wrightson	5/-	21/3	+1/-	22½	17½*	4 2 3	22/3	16/9
Heatrae	2/-	6/6	+3d	15	20	6 3 0	6/6	4/-
Henley's	10/-	12/6	+1/-	11½	11½	9 4 0	14/6	10/6
Holophane	5/-	13/9	+6d	30	37½	8 2 9*	13/9	12/6
Hoover	5/-	43/-	+6d	50	50	5 16 3	44/-	31/-
I.C.I.	£1	32/9	+1/3	10	12	4 17 9*	32/9	23/9
Intl. Combustion	5/-	27/-	+1/-	22½	25	4 12 6	27/-	19/3
Johnson & Phillips	£1	19/3	+1/9	10	5	5 4 0	25/-	15/-
Lancashire Dynamo	£1	40/-		11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	14/9		15	15	5 1 9	14/9	12/6
Lister, R. A.	£1	25/6	+1/-	10	10	7 16 9	26/3	23/-
London Elec. Wire	£1	46/9	+6d	12½	12½	5 7 0	46/9	39/6
Lucas, J.	£1	38/-	+6d	7½	7½	3 19 0	38/-	27/9
Marconi Marine	£1	34/-		10	10	5 17 9	34/-	29/-
Marryat & Scott	2/-	6/9x.c.	+3d	35	37½	5 11 0	14/-	10/3
Mather & Platt	£1	39/6	+9d	15	15	5 1 3*	40/-	29/6
Metal Industries	£1	34/6		9	14	8 2 3	35/-	22/9
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	48/3	44/-
Morphy-Richards	4/-	17/3	+6d	50	20*	4 12 9	17/3	14/6
Murex	£1	48/-		20	17½	7 5 9	58/3	48/-
Newman Ind.	2/-	2/3		10	10	8 17 9	2/9	2/3
Oldham & Son	1/-	2/6		17½	17½	7 0 0	2/7	2/3
Parnall (Yate)	5/-	17/6	+2/6	12	12	3 8 6	17/6	5/9
Parsons, C. A.	£1	49/3	+3/-	8½	7½*	3 1 0	53/6	43/-
Plessey	10/-	62/-	+3/-	30	30	4 16 9	62/-	55/-
Pye "A" Deferred	5/-	14/6	+9d	12½	12½	4 6 3	14/6	10/-
Reyrolle	£1	80/-	+2/6	17½	17½	4 7 6	84/6	73/6
Rheostatic	4/-	6/-		12½	12½	8 6 9	8/-	6/-
Richardsons Westgarth	10/-	14/3	+6d	16½	8½*	5 17 0	15/-	13/-
Scottish Cables	4/-	10/3x.c.	+3d	27½	27½	6 5 0*	16/9	12/3
Simon-Carves	5/-	28/3	+1/3	20	25	4 8 6	28/3	22/6
Smith (England), S.	4/-	9/9		17½	20	4 2 0*	10/-	7/-
Southern Areas	£1	9/9		7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	4/9	−6d	15	15	15 15 9	6/3	4/9
Sturtevant	5/-	15/3	+6d	15†	15†	4 18 3†	18/-	14/9
Sun Elec.	£1	50/-		25	25	10 0 0	50/-	47/3
Switchgear & Cowans	5/-	13/6	+1/9	25	22½	8 6 9	13/6	8/9
Taylor Tunnicliff	5/-	13/9	+6d	15	17½	6 7 3	13/9	11/9
T.C.C.	10/-	32/6		25	25	7 13 9	38/6	32/6
T.C. & M.	£1	23/6		8½	8½‡	7 4 9	27/-	20/-
Telephone Mfg.	5/-	4/9		10	10	10 10 6	5/3	4/6
Telephone Rentals	5/-	12/6	+6d	12½	12½	5 0 0	12/6	9/9
Thompson (John)	5/-	24/-		25	25	5 4 3	27/-	23/-
Thorn Elec. "A"	5/-	20/6		17½	17½	4 5 3	23/3	17/-
Thornycroft	£1	25/-	+2/6	12½	12½	10 0 0	27/9	21/-
Tube Investments	£1	56/9	+1/9	13½	15	5 5 9	56/9	48/3
Vactric	5/-	24/-	+4/6	25	25	5 4 3	24/-	14/3
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	15/3		20	22½	5 18 0	15/3	11/-
Ward & Goldstone	5/-	28/6	+1/6	40	25*	4 7 9	29/-	23/6
Watford	2/-	6/3		25	25	6 8 0*	7/6	5/-
Westinghouse	£1	38/-		18	10*	5 5 3	40/-	32/3
West, Allen	5/-	12/-	+3d	15	12½*	5 4 3	12/-	9/3
Wolf Electric	5/-	7/9	+6d	20	10*	6 9 0	9/-	6/9

Marryat & Scott

The 2s ordinary shares of Marryat & Scott Holdings, at 6s 9d, are now quoted ex the 100 per cent scrip issue, the new shares standing a fraction higher by virtue of being transferable free of stamp duty while in allotment-letter form. Shareholders have been advised not to take this issue as necessarily an indication of larger dividend distributions to come. At the same time, they were told by the chairman last month that the volume of work on hand was higher than it had been a year earlier, and that output was keeping pace. Over a long period the company has been reporting regularly each year a material improvement in earnings, and the rate of the dividend has been raised moderately on four of the last five occasions. The latest payment of 37½ per cent was covered practically four times over by a net profit of £92,000, after tax. If half this rate were paid on the doubled capital the yield from the shares would be a little over 5½ per cent.

Scottish Cables Capital

Another scrip issue now in the market results from a free distribution of shares, in the proportion of five for every seven held, by Scottish Cables, whose issued ordinary capital is now £1 million. In this case also there was the customary warning against regarding the operation as implying an increase in the amount of the dividend. Adjusted to the increase in the capital ranking for future dividends, the 1957–58 payment of 27½ per cent would be equivalent to approximately 16 per cent, and on that basis there is a prospective yield of 6½ per cent on the 4s shares at a price of 10s 3d, ex- the scrip issue.

Globe Telegraph Issues

Allotment letters are expected to go out next week to shareholders of Globe Telegraph & Trust in connection with a double issue of new ordinary shares. For every twelve existing shares, holders are to be offered one new share free, by way of a scrip issue, and another for cash at 5s. On the basis of the recent quotation of 11s 9d for the 5s shares, there is a prospective price of about 10s 5d when they are quoted ex- both issues, and a yield of 4·8 per cent if the dividend on the increased capital is maintained at the rate of 10 per cent paid for the last two years. The company's latest balance sheet, dated 30th June, shows that quoted investments standing in the books at about £9½ million had a market value at that date of close on £17½ million. Some 95 per cent of the investments, by value, were in ordinary shares; 69 per cent of them were in Great Britain and the Commonwealth, and 24 per cent in America and Canada.

REPORTS and DIVIDENDS

Thorn Electrical Industries, Ltd.—A preliminary statement of the financial results for the year to 31st March last was published in our last issue. With the full report and accounts now issued, Mr. J. Thorn (chairman and managing director) has circulated his review of the year. In this he says that the concentration of the lighting activities into Atlas Lighting, Ltd., has proved very successful and has contributed towards another record year in the lighting field. They continue to lead the industry in the fluorescent field and, since the reduction in the price of the 8ft fluorescent tube, which they initiated when they commenced mass production of this size, demand has increased considerably and it is fast becoming standard for large industrial and commercial installations.

The incandescent lamp market continues to be highly competitive, and this competition is accentuated by the fact that the growth rate of the market has slowed down, mainly due to the large increase in the use of fluorescent tubes over the last few years. Although the re-equipping of the main incandescent lamp factory at Merthyr Tydfil was only completed in 1956, they have already started to build new and faster machinery. Sales of fluorescent lighting fittings have increased considerably over the previous year and the full benefits of the improvements at the Spennymoor factory are now being felt. The company will shortly be announcing a new range of inexpensive fittings for industrial and commercial use.

The Street Lighting Department continues to flourish, and two further "Son et Lumière" spectacles (at Cardiff and Greenwich) have provided them with the opportunity of demonstrating their outdoor lighting equipment, particularly their fluorescent colour-changing and dimming units. Ekco-Ensign Electric, Ltd., has again made a substantial contribution to the lighting business.

In the export field, they have maintained their position despite ever-growing competition, and they have recently opened branches on the Continent so that they may be better placed to meet the changing needs of European trading. Production at the lamp factories in Australia, New Zealand and South Africa has continued to expand and the range of television receivers made in the Melbourne factory is being well received in the Australian market.

Referring to the arrangement with E.M.I. by which Thorns also control "His Master's Voice" and Marconiphone Radio & Television, the chairman says that during the year under review, which was occupied with the initial stages of the arrangement, satisfactory progress has been made. The Ferguson range of television and radio receivers continues to enjoy great popularity.

The cooker division has had considerable success with the new Tricity "Viscount" and has since introduced the "Marquis," a luxury model, which has met with a good reception by the public.

Ward & Goldstone, Ltd. — The annual meeting was held on 12th August, Mr. S. Goldstone (chairman and managing director) presiding. In the course of his statement, which had been previously circulated, Mr. Goldstone said that production, stimulated by demand and made possible by the employment of much enlarged manufacturing facilities, had enabled them to achieve a record volume of output far in excess of any past performance. During the year the continued depression in the price of certain commodities resulted in reduced selling rates and stock values. Such conditions, allied to basic wage and service increases, had brought about a further contraction in profit margins, intensified by severe competition both at home and overseas. Regarding the future, in an order of static economy designed to arrest the inflationary symptoms, the rate of expansion which had coloured preceding years could not be expected.

Cable & Wireless, Ltd.—The report and accounts for the year to 31st March last have been published by H.M. Stationery Office (1s 3d net). The total revenue is £14,429,026, as compared with £13,690,215 for 1956-57, and after meeting all charges, but before taxation, the profit for the year is £76,478 higher at £2,305,886. The following appropriations have been made:—Taxation, £802,708; equalisation of United Kingdom taxation, £34,000; staff pensions, £100,000; general reserve, £610,000; dividend of 4 per cent (unchanged), £690,000. The balance carried forward is £611,700 (against £542,522 brought in).

Newton Brothers (Derby), Ltd.—The trading profit for the year to 31st March last amounts to £145,394, as compared with £144,301 for 1956-57, to which is added investment income, etc., of £24,943. After meeting all charges, including £71,434 for taxation, the net profit is £69,029 (against £58,668). Reserves receive £35,000 and it is proposed to pay a dividend for the year of 12½ per cent, plus a bonus of 7½ per cent (both unchanged). The balance carried forward is £52,261 (against £50,026 brought in).

Vactric, Ltd., announces that it has accepted an offer for the entire issued share capital of its hire purchase subsidiary, Awley Finance Co., Ltd. The consideration is £600,000 plus 1,050,000 new Lombard Banking, Ltd., ordinary shares at 5s each fully paid (ex the interim dividend shortly to be declared by the Lombard Board). Application is being made to the Capital Issues Committee for consent to the issue of the new Lombard shares. The Board has under consideration the possibility of making a distribution to shareholders of the Lombard Banking shares.

Christy Bros., Ltd., report that after providing £41,804 for taxation, the group net profit for the year to 31st March last is £37,030, as compared with £23,930 for the preceding year. A sum of £19,250 is placed to subsidiaries' general reserve and it is proposed to pay a dividend of 7 per cent for the year (unchanged). The balance carried forward is £43,702 (against £39,125 brought in).

Radio Rentals, Ltd.—At an extraordinary general meeting held on 13th August, resolutions to increase the capital of the company to £3,000,000, the capitalisation of £600,000 being part of the amount standing to the credit of the general reserve, and the addition to Article 96 of the Articles of Association were duly passed.

Phœnix Telephone & Electric Holdings, Ltd.—The accounts for the year to 28th February last show group profits, after taxation of £99,500, of £87,895, as compared with £130,110 for the preceding year. General reserve receives £50,000 and the ordinary dividend for the year is maintained at 20 per cent. The balance carried forward is £22,390 (against £22,837 brought in).

The London Electric & General Trust, Ltd., reports a group revenue of £176,202 for the year to 30th June last, as compared with £170,340 for the preceding year. Taxation requires £65,165, and the net revenue is £79,125 (against £76,856). The proposed final ordinary dividend is 11 per cent, again making 15 per cent for the year. It is also proposed to make a one-for-four "rights" issue at 40s per £1 share.

The East African Power & Lighting Co., Ltd., reports group profits for 1957 of £819,384, as compared with £684,092 for 1956. It is proposed to pay a final dividend of 5 per cent (against 4½ per cent), making 8 per cent (7½ per cent) for the year. The balance carried forward is £265,843 (against £214,696 brought in).

Hilger & Watts, Ltd., is raising its interim dividend from 3 per cent to 5 per cent. It is stated that the increase does not imply a larger total for the year.

Air Control Installations, Ltd.—The whole of the ordinary share capital of this company has been acquired by Beyer Peacock & Co., Ltd., Gorton, Manchester. Mr. F. D. Moul will shortly be retiring from his position as chairman and managing director, but will continue to be associated with the company in an advisory capacity, as director and president. The general policy of the company will remain

unchanged, and it will continue to manufacture air treatment equipment as heretofore.

The English Electric Co., Ltd., has declared an interim dividend of 4 per cent (unchanged).

Desoutter Brothers (Holdings), Ltd., are paying an interim dividend of 6⅔ per cent (against 12½ per cent) on doubled capital.

Lancashire Dynamo Holdings, Ltd., has declared an interim dividend of 4 per cent (unchanged).

Increases of Capital

Superheater Co., Ltd.—Increased by £600,000 in 1,673,800 "A" ordinary and 726,200 ordinary shares of 5s each, beyond the registered capital of £1,000,000.

Tungstone Products, Ltd.—Increased by £399,900 in £1 ordinary shares, beyond the registered capital of £100.

New Companies

Vencourt Properties Co., Ltd.—Registered 27th May. Capital £1,000. To acquire all the freehold and leasehold premises, plant, machinery and stock in trade connected with the business of manufacturing electrical infra-red and other lamps and blood transfusion apparatus now carried on by the Ergon Electrical Manufacturing Co., Ltd. Directors: Mrs. Hertha Manheimer and G. F. Manley. Regd. office: Orchard Works, Vencourt Place, W.6.

Electropliances (Middleton), Ltd.—Registered 23rd May. Capital £1,000. Manufacturers and repairers of and dealers in wireless and electrical goods, etc. Directors: D. Livesey and H. Bertenshaw. Regd. office: 107, Oldham Road, Middleton, Lancs.

B. & R. (Trade Supplies), Ltd.—Registered 23rd May. Capital £10,000. Manufacturers of and dealers in electric lamps, valves, cathode ray tubes, etc. Directors: R. F. Boardley and E. J. Roberts. Regd. office: 91, High Street, Lowestoft.

Neptune Electronics, Ltd.—Registered 23rd May. Capital £100. Electronic and automation engineers, etc. Directors: T. B. Smith and Dorothy M. Smith. Regd. office: 15, Coalway Road, Wolverhampton.

Leech & Hainge (Rentals), Ltd.—Registered 22nd May. Capital £100. Manufacturers, repairers and hirers out of and wholesale and retail dealers in radio, electrical and mechanical apparatus of all kinds, etc. Directors: P. J. Leech and J. A. W. Hainge. Regd. office: 112, London Road, Headington, Oxford.

Sound Security, Ltd.—Registered 1st May. Capital £500. Electrical, electronic, mechanical and general engineers and manufacturers of and dealers in burglar alarms, machinery, etc. Directors: S. W. Grundy, D. R. Mauchel and M. Crossick. Regd. office: Copthall House, 13, Copthall Avenue, E.C.2.

L.E.S. Central Purchasing, Ltd.—Registered 17th July. Capital £1,000. Manufacturers of and dealers in electrical equipment, apparatus, machinery, etc. Solicitors: Bulcraig & Davis, Amberley House, Norfolk Street, W.C.2.

Birkenshaw Electronics, Ltd.—Registered 17th July. Capital £1,000. Manufacturers of and dealers in electronic and electrical apparatus, machines and equipment, etc. Directors: M. Birkenshaw and A. Lee. Regd. office: Gilpins Yard, Cromwell Street, Leeds, 9.

Marpat Manufacturing, Ltd.—Registered 16th July. Capital £1,000. Manufacturers and repairers of and dealers in electrical plant, machinery, fittings and accessories, etc. Regd. office: Empire House, St. Martin's-le-Grand, E.C.1.

Hydramation, Ltd.—Registered 22nd July. Capital £100. Electronic, electrical, hydraulic and heating and ventilating engineers, etc. Directors: R. L. S. Sinclair, D. E. Turnbull and R. Coupland. Regd. office: 5, St. Mary's Place, Newcastle-on-Tyne, 1.

Chelsea Electric, Ltd.—Registered 23rd July. Capital £1,000. Electrical, heating, ventilating, air conditioning, refrigerating and general engineers, etc. Directors: J. W. Anderson and Helen L. Tallent. Regd. office: 184, Walton Street, S.W.3.

Field Robinson & Co., Ltd.—Registered 6th August. Capital £100. Electrical engineers and contractors, manufacturers of and dealers in radio apparatus, etc. Directors: C. A. Field and J. S. Robinson. Regd. office: 93/5, Hawes Side Lane, Blackpool.

Liquidations

Peto Scott Electrical Instruments, Ltd.—The first meeting of creditors was held in London on 15th August. Mr. G. M. Haddon, Senior Official Receiver, reported that a statement of affairs disclosed gross liabilities of £457,831 and assets estimated to realise £412,562. According to the *Financial Times*, Mr. Norman Cork, acting for a receiver appointed by a debenture holder in May last, said the company's business had been continued as a going concern and two persons were interested in acquiring it. He added that representatives of the Admiralty and the Ministry of Supply were at the meeting and he believed they had both asked if the business could be continued. Replying to a creditor, Mr. Cork said he felt it would be wrong for him to give details of the offers, but added: "If the sale goes through there will be a reasonably substantial surplus for the unsecured creditors. More than that I cannot say."

L. Barr & Co., Ltd., radio and television engineers and retailers and electrical contractors, 8, High Street, Clacton-on-Sea, Essex.—Winding up voluntarily. Liquidator, Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, appointed 6th August.

Wilsons (Wood Green), Ltd., electrical engineers, British Railways Depot, Station Road, Wood Green, London, N.22.—Winding up voluntarily. Liquidator, Mr. L. V. Muskett, 20, Wormwood Street, London, E.C.2, appointed 5th August. Particulars of claims to the liquidator by 23rd September.

Bankruptcies

G. F. Hedger, 80, Grenville Road, Plymouth, trading as Hedger & Greenway, electrical contractor, formerly carrying on business in partnership with another at that address.—Trustee, Mr. J. E. Ellis, 50, The Terrace, Torquay, appointed 6th August.

C. S. Smith, residing and lately carrying on business at 9, Pedder Street, Morecambe and Heysham, electrical engineer and contractor.—Trustee, Mr. J. A. Freeman, 8, Manchester Road, Bury, appointed 31st July.

G. Love and **F. E. Love,** trading as Love Bros., Holt Road, North Elmham, Norfolk, cycle, radio and electrical engineers and newsagents.—First dividend of 13s 4d in the £, payable at the Official Receiver's office, Castle Chambers, Opie Street, Norwich.

J. H. Dakin, 13, Church Road, Edgbaston, Birmingham, electronic engineer, lately carrying on business at 140, Great Charles Street, Birmingham.—Receiving order made 6th August on debtor's own petition.

J. V. Lythgoe and **T. O'Brien,** carrying on business in co-partnership, formerly at 385, Halifax Road, Rochdale, but lately at 94-96, Cheetham Street, Rochdale, under the name of Swift Clean Vac Shop, as electrical appliance dealers.—Public examination 6th October at the County Court Buildings, Fleece Street, Rochdale.

K. J. Rodgers, carrying on business under the style of Castle Engineering at The Crofts, Moorgate, Rotherham.—Public examination 9th October at the County Court Hall, Bank Street, Sheffield, 1.

FORTHCOMING EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Thursday, 17th July, to Thursday, 27th September

CARDIFF.—Cardiff Castle. *Daily Telegraph* "Son et Lumière."

Thursday, 31st July, to Saturday, 11th October

GREENWICH.—"Son et Lumière." Presented for the Ministry of Works by Atlas Lighting, Ltd.

Tuesday, 26th August

BIRKENHEAD.—Prenton Golf Course. Electrical Industries Golf Championship, Merseyside and North Wales Area Competition.

Wednesday, 27th August, to Wednesday, 3rd September

GLASGOW.—British Association for the Advancement of Science. Annual meeting.

Wednesday, 27th August, to Saturday, 6th September

LONDON.—Earls Court. National Radio and Television Exhibition.

Tuesday, 2nd September, to Thursday, 11th September

LONDON.—Olympia. Domestic Equipment Trades Fair.

Tuesday, 16th September, to Friday, 19th September

HARROGATE.—Association of Public Lighting Engineers. Annual conference.

Monday, 22nd September, to Friday, 26th September

BIRMINGHAM.—Institute of Metals. Golden Jubilee Autumn Meeting.

Monday, 22nd September, to Saturday, 27th September

MANCHESTER.—City Hall. National Business Efficiency Exhibition.

Tuesday, 23rd September

LONDON.—Caxton Hall. A.S.E.E. Electrical Engineers Exhibition. Ballot meeting.

Wednesday, 24th September, to Friday, 3rd October

LONDON.—Olympia. Industrial Fuel Efficiency Exhibition.

Thursday, 25th September

LONDON.—Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker Mr. W. Laver.

Friday, 26th September, to Saturday, 4th October

LONDON.—Earls Court. Commercial Motor Show.

Monday, 29th September

VIRGINIA WATER.—Wentworth Golf Course. Electrical Industries National Golf Championship finals, followed by the annual dinner (7.30 for 8.30 p.m.) at the Park Lane Hotel, Piccadilly, W.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1954

7753. Clang, Ltd., and Barnett, A.—Socket fittings for electrical conduits. 9th June, 1955. (800141.)

9216. Ferranti, Ltd.—Electromagnetic pick-offs. 24th March, 1955. (800131.)

10876. Mullard Radio Valve Co., Ltd.—Semi-conductive devices. 25th January, 1955. (800010.)

12384. Electric & Musical Industries, Ltd.—Voltage function interpolating devices. 28th April, 1955. (800071.)

12779. National Research Development Corporation.—Semi-conductor devices. 6th April, 1955. (Cognate application 529, 7th January, 1955.) (800221.)

13605. Siemens Edison Swan, Ltd.—Means for locating electronic discharge tubes in holders therefor. 10th May, 1955. (800180.)

16037. National Research Development Corporation.—Devices for controlling the transmission of electromagnetic waves. 3rd May, 1955. (800029.)

27930. Electric & Musical Industries, Ltd.—Formation of mosaic screens as are utilised in television pick-up tubes. 13th September, 1955. (800251.)

29072. English Electric Co., Ltd.—Register mechanisms. 30th September, 1955. (800031.)

1955

482. Rare Metals Foundation.—Process for the electrolytic production of indium of high purity. 6th January, 1955. (800153.)

4918. Sparcatron, Ltd.—Apparatus for cutting electrically conductive materials. 17th May, 1956. (Cognate applications 6021, 1st March, 1955, and 9145, 29th March, 1955.) (800033.)

5478. Metropolitan-Vickers Electrical Co., Ltd.—Apparatus for identifying vehicles. 15th February, 1956. (800190.)

12271. Simmonds & Stokes (Niphan), Ltd.—Electrical cable couplings of plug and socket type. 18th April, 1956. (800037.)

12315. General Electric Co., Ltd.—Interlock mechanisms. 27th April, 1956. (800184.)

14177. Westinghouse Brake & Signal Co., Ltd., and French, E. L.—Sealed containers for electrical components. 10th May, 1956. (800133.)

16162. Pye, Ltd.—Radio frequency heating. 6th June, 1956. (800185.)

19535. Southern United Telephone Cables, Ltd.—Method and apparatus for measuring the rate of flow of fluids and detecting leaks in the sheaths of electric cables 6th July, 1956. (Cognate application 21759, 17th August, 1955.) (800005.)

19900. General Electric Co., Ltd.—Electric surge divertors. 9th July, 1956. (800252.)

21994. Standard Telephones & Cables, Ltd.—Semi-conductor devices. 29th July, 1955. (800300.)

23981. Goldstaub, H. H.—Conduits carrying electric conductors. 20th August, 1956. (800274.)

25667. General Electric Co., Ltd., Bowtell, J. N., and Moore, J. A.—Manufacture of hermetically sealed glass vessels containing gas under pressure. 7th September, 1956. (800193.)

26165. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Remote control systems for electrical distribution networks. 13th September, 1955. (800040.)

29188. General Electric Co., Ltd.—Electric fusible cut-outs. 15th October, 1956. (800245.)

31810. General Cement Mfg. Co.—Electric connector. 7th November, 1955. (800102.)

32949. Hazeltine Corporation.—Direct coupled electronic amplifier circuits. 17th November, 1955. (800100.)

35902. Philips Electrical Industries, Ltd.—Circuit arrangements for television receivers and intended for filtering out noise signals. 14th December, 1955. (800146.)

36344. General Electric Co.—Rectifier units. 19th December, 1955. (800297.)

37481. United States Steel Corporation.—Aluminium coated welding electrode and method of producing same. 30th December, 1955. (800044.)

1956

838. Svenska Metallverken Aktiebolaget.—Control of electric motors driving metal-blank rolling mills and the like. 10th January, 1956. (800109.)

1591. British Thomson-Houston Co., Ltd.—Electric winder systems for hoisting plants. 9th January, 1957. (800111.)

3685. M.K. Electric, Ltd., Arnold, C. L., Dowsett, R. W., and Sharman, A. V.—Wall boxes for electrical accessories. 15th March, 1957. (Cognate application 12016, 19th April, 1956.) (800174.)

5649. Metropolitan-Vickers Electrical Co., Ltd.—Polyphase voltage regulators. 13th February, 1957. (800281.)

5789. Marconi's Wireless Telegraph Co., Ltd.—Frequency stabilisers. 24th October, 1956. (Addition to 741867.) (800239.)

11971. Sperry Rand Corporation.—Bobbin for magnetic cores and magnetic core assemblies employing such bobbins. 19th April, 1956. (800054.)

13235. Bendix Aviation Corporation.—Voltage reduction circuit. 30th April, 1956. (800241.)

13435. Sylvania Electric Products, Inc.—Power supply for indirectly heated cathodes. 1st May, 1956. (800292.)

18011. Bristol Co.—Electrical control systems. 11th June, 1956. (800125.)

19751. Marie, G. R. P.—Resonant directional waveguide couplers. 26th June, 1956. (800056.)

20420. British Thomson-Houston Co., Ltd.—Picture projectors. 2nd July, 1956. (800026.)

21311. Specialties Development Corporation.—Electrical circuit automatically responsive to a predetermined change or rate of change of a condition, e.g. temperature. 10th July, 1956. (800163.)

23231. Westinghouse Electric International Co.—Washing machines. 27th July, 1956. (800007.)

24558. Philips Electrical Industries, Ltd.—Cathodes of the dispenser type. 10th August, 1956. (800219.)

25227. Western Electric Co., Inc.—Retractile electrical cords. 17th August, 1956. (800128.)

26177. Ward & Goldstone, Ltd., and Holt, H.—Electric lampholders. 16th May, 1957. (800059.)

26542. General Electric Co.—Electric capacitors. 30th August, 1956. (800014.)

26854. Philips Electrical Industries, Ltd.—Removing metal from a workpiece by means of an electrode which is under electric potential. 3rd September, 1956. (800061.)

27173. Philips Electrical Industries, Ltd.—Image intensifiers. 5th September, 1956. (800226.)

29129. Hollandse Signaalapparaten N.V.—Electrical terminal strip. 24th September, 1956. (800129.)

30745. Loewy Engineering Co., Ltd.—Thermal safety switch device for electrical apparatus. 9th October, 1956. (800247.)

33144. Hoover, Ltd.—Suction cleaners. 30th October, 1956. (800202.)

34297. Standard Telephones & Cables, Ltd.—Printed circuits. 9th November, 1956. (800064.)

34485. Babcock & Wilcox, Ltd.—Method of and apparatus for purifying high pressure steam. 12th November, 1956. (800189.)

37351. Collins Radio Co.—Peak voltage regulator. 6th December, 1956. (800066.)

37702. Schröter, M. C. (trading as Hardi Dr. R. Schröter).—Make-and-break electric contact device for electromagnetically operated pumps. 10th December, 1956. (800101.)

39292/3. Singer Manufacturing Co.—Electric clutch-brake driving device. 27th December, 1956. (800149/50.)

1957

2115. Westinghouse Electric International Co.—Starting systems for electric motors. 21st January, 1957. (800207.)

STREET LIGHTING NOTES

A new street lighting system, comprising over 400 lanterns each housing three 5ft 80 W "Osram" fluorescent tubes, is now installed along all the main roads in **Chelsea.** It represents one of the biggest single street lighting contracts ever awarded to the General Electric Co., Ltd. The contract includes the supply of steel columns, lanterns, gear and "Osram" lamps, and their erection.

For the main shopping streets, the Council has used 388 of the new G.E.C. "Three-Eighty" fluorescent lanterns carried at 12½ degrees above the horizontal on a special bracket. This lantern has an inclined, tapered appearance and the light is controlled by machined "Perspex" refractor plates designed in the G.E.C. Research Laboratories. The last stage of the relighting programme has involved lighting part of the Thames Embankment. It is heavily tree-lined and is lighted by "Three-Eighty" cut off lanterns suspended centrally. The columns chosen by the Council are of a new design which has been produced to meet a constant demand for a slim, plain steel column of a continuous taper.

An order has been received by Siemens Edison Swan, Ltd., for 27 twin and 28 single "Kuwait" fluorescent lanterns to light the proposed **Oxford** by-pass. The company is also to supply 79 "Crawley" fluorescent lanterns for lighting the service road that will run alongside the new by-pass to serve the Morris Motor Co.'s body works. All street lighting poles will be supplied by Stewarts & Lloyds, Ltd.

For the town of **Newtownabbey** in Northern Ireland, created by the amalgamation of seven villages to the north of Belfast, Atlas Lighting, Ltd., has received one of its largest orders to date for fluorescent street lighting equipment. Two schemes for both "A" and "B" lighting are involved. The Group "A" scheme uses 200 "Alpha Two" 5ft 80 W two-tube and 200 "Alpha Four" 4ft 40 W three-tube fluorescent lanterns. The Group "B" scheme utilises "Beta Two" lanterns.

Now starting on the second phase of its street lighting improvement scheme, costing £10,000, **Twickenham** Borough Council decided at its July meeting to make representations to the South Eastern Electricity Board for the early conversion from d.c. to a.c. of the central area of Twickenham. Until this is done, the new lighting cannot be installed on the main through roads in the borough.

Richmond (Surrey) Council has finally decided to convert the lighting of Richmond Green and Kew Green from gas to electricity but fluted steel columns will be used instead of the concrete posts. The Council is for the time being retaining gas lighting in roads used little by either pedestrians or traffic.

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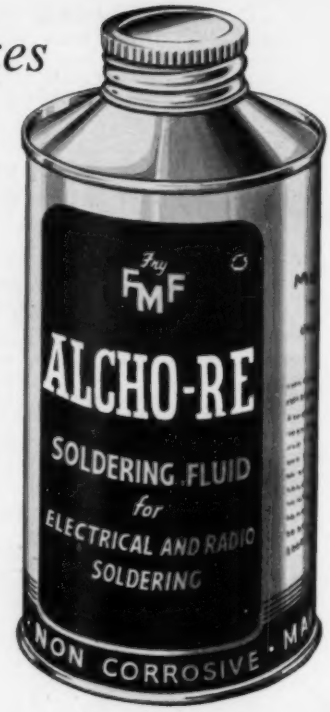

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T.170

GENERATION AND DEVELOPMENT

Supply Reinforcement at Bonnybridge

A scheme for the reinforcement of supplies distributed at Bonnybridge has been approved by the South of Scotland Electricity Board at an estimated cost of £566,000. Provision is made in the scheme for the installation of two 60 MVA 132/33 kV transformers, together with the associated 33 kV switchgear, the construction of duplicate transformer feeders to Greenhill and Larbert and the raising of the operating voltage of the Kilsyth ring to 33 kV and of part of the secondary distribution system from 6·6 kV to 11 kV. The work will be completed by 1961.

Inquiry into Lancashire Scheme

Two routes were submitted for a section of an overhead line between Padiham and Clitheroe that was the subject of a recent public inquiry. Mr. J. W. Chant, secretary North Western Electricity Board, said it was the first time that alternative routes had been provided for consideration at such an inquiry.

It was stated that the proposed line was needed to augment the supply to Clitheroe and all the objectors said they recognised the need for the power supply. They considered, however, that the section across the Sabden Valley should be laid underground. The extra cost of this was put by the Board at not less than £30,000. Mr. E. W. Hewlett, sub-area engineer, said that the line would be carried on wooden poles. He agreed that the scenic beauty of the area was of a very high order and said that deviations had been made in the route so that the line should be as inconspicuous as possible.

Freedom of Choice

The North Eastern Electricity Board has asked the Newcastle-on-Tyne City Council to give tenants of new council houses freedom of choice in the use of gas and electrical appliances. At present only one quarter of new houses are fitted with electric cookers, and the rest with gas cookers. The Board state that at other places on Tyneside, where tenants are allowed to make a choice, about two-thirds decide on electricity. The Housing Committee is to obtain the views of tenants before taking action.

Belfast Deficit

Presenting his annual report to Belfast City Council on 11th August, Mr. R. P. Watson, city electrical engineer and manager, said that costs had been rising steeply for years and there was no indication yet of stabilisation. In view of the frequency of increases in prices of other commodities, the increases in electricity charges had been modest. The average price per kWh sold for all purposes during 1957-58 was 1·823d, a rise of only 0·118d, or 6·92 per cent, over the previous year. In the last general tariff increase the highest rate, for prepayment supplies, was raised to 8d/kWh, and to enable the Corporation, if necessary, to make increases at a future date he recommended that application should be made to the Ministry of Commerce to have the statutory maximum raised to 1s.

Reviewing the year's accounts, which showed an overall net deficit of £69,130, he said that recession in certain sections of industry and the effect of labour disputes were reflected in a smaller increase in demand from industrial users. There had been a further reduction in the use of electricity by the Transport Department (from 40·3 million kWh to 26·9 million) and consumption would be again reduced in the current year as a result of the withdrawal of trolley-buses from the Holywood Road route. Commenting on this trend, Mr. Watson said that such a policy of gradually eliminating electric traction, in spite of its being the cheapest form of public transport, "must have the inevitable repercussion of progressively increasing the cost of electricity per unit to the Transport Department and in a lesser degree affect the cost of electricity generally."

Mr. Joseph Mackle, general manager of the Corporation Transport Department, in commenting on Mr. Watson's report said that it was not transport policy to reduce trolley-bus services. His department was replacing omnibuses on the Whiterock route with trolley-buses, he pointed out. "The reduction in trolley-bus services is matched by the fall in omnibus services and is governed by the falling number of passengers. The withdrawal of trolley-buses from the Holywood Road route is a temporary measure only in view of construction work required on the new Holyrood by-pass."

Mr. Mackle said he did not agree that trolley-buses provided the cheapest kind of public transport. He failed to see how electricity for public use could become much dearer since the Transport Department was bearing the interest and loan charges on the system's special equipment.

Glasgow to Lose its Trams

For some years past the future of Glasgow Corporation's tramways has been in the balance. It has now been decided, however, that the whole of the fleet of about 600 trams will be withdrawn from service and the routes converted to diesel bus operation within the next five years. By 1961 only about 250 of the more modern "Coronation" trams will remain and these will be replaced by the end of 1963. It is stated that no additions to the trolley-bus fleet, numbering about 200 vehicles, are proposed.

Referring to the previous plan to scrap the trams over a period of about 15 years, Councillor J. Bennett, convener of the Corporation Transport Committee, said last week that he thought it was right to get on with the job. He gave the cost of the replacement programme for the first three years as £2¾ million.

The Transport Department's accounts for 1957-58, recently published, showed a substantial loss, including a deficit of £577,000 on the tramways.

Smokeless Zones

Halifax Corporation has received provisional approval from the Minister of Health for a proposed smokeless zone in the centre of the town. The decision is not likely to have effect before August next year

The order making a proposed smokeless zone in the Saltaire and Hirst Wood areas of Shipley, involving some 1,211 houses, is expected to be confirmed by next April and to come into force in about a year's time.

The Eastern Electricity Board has rebuilt the interior of its Ipswich Service Centre, which is now one of the largest in the Board's area

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Ashbourne. — R.D.C. 18th September. Supply and installation of submersible motor borehole pump, together with the necessary electrical equipment and starting gear, for water supply scheme. H. Litchfield, surveyor, Compton Offices, Ashbourne.

Australia.—Director, Stores and Contracts, Postmaster-General's Department, Melbourne. 2nd October. Rectifiers. (E.S.B. 20098/58. Ten/34004.)* 7th October. Insulated staples. (E.S.B. 20099/58. Ten/34007.)*

Electricity Commission of New South Wales, Sydney. 29th September. Two 11-8/132 kV, 70 MVA transformers. (E.S.B. 20233/58. Ten/34026.)*

Western Australian Government Tender Board, Perth. 30th October. Two electrically-driven ash-sea water slurry centrifugal pumps with electric motors. (E.S.B. 20170/58. Ten/34032.)*

Batley.—Corporation. 28th August. Tungsten and discharge lamps for Street Lighting Department. (See this issue.)

Belfast.—Northern Ireland Ministry of Finance. 22nd September. Electrical installation in connection with experimental herbage drying at Loughry Agricultural College, Cookstown, Co. Tyrone.

Electricity Board for Northern Ireland. 17th September. Electrical installation in new office block at "Danesfort," Malone Road. J. McCandless, consulting engineer, 6, Murray Street, Belfast.

Burma.—Burma Purchase Board, Rangoon. 26th August. Mild steel electrode earth clamps, cable connectors and lugs, and hose connectors. (E.S.B. 19957/58. Ten/34012.)*

Cardiff.—Corporation. 15th September. Street lighting equipment. (See this issue.)

Dungannon (co. Tyrone).—9th September. Electrical installation in proposed new intermediate school for boys and girls, Donaghmore road. McAuslan & Abbott, consulting engineers, 16, Bedford Street, Belfast.

Formosa.—Central Trust of China, Taipei. 3rd September. Electric motors and capacitors. (E.S.B. 19742/58/I.C.A. Ten/33953.)

Heston and Isleworth.—10th September. Corporation. Street lighting equipment. (See this issue.)

India.—National Coal Development Corporation (Private), Ltd., Calcutta. 8th September. P.i.l.c., d.w.a. cables. (E.S.B. 20196/58 Ten/34037.)*

Inverness.—Burgh Council. 13th September. Installation of automatically controlled, electrically driven pump set at Loch Duntelchaig. Water engineer, Town House.

Iran.—Plan Organisation, Teheran. 3rd September. Electrical equipment for the town of Firouzabad. (E.S.B. 19680/58. Ten/33946.)* 8th September. Electrification of the town of Minab. (E.S.B. 19679/58. Ten/33948.)*

Ministry of Posts, Telegraphs and Telephones, Teheran. 14th September. Two 100 kW medium-wave radio transmitter posts. (E.S.B. 19677/58. Ten/34002.)*

Korea.—Government Office of Supply, Seoul. 2nd September. Equipment for 2,000 kVA substation, including transformers, oil circuit-breakers, switchboards, batteries, etc. (E.S.B. 20130/58/I.C.A. Ten/34041.)*

Kuwait.—Government Department of Electricity. 25th August. Wood poles, pole boxes and accessories for 11 kV overhead lines. (E.S.B. 19484/58. Ten/33965.)*

Newark-on-Trent. — Corporation. 15th September. Street lighting equipment. (See this issue).

Newcastle-under-Lyme.—Borough Council. 1st September. 168 140 W sodium vapour group "A" street lighting units. Borough engineer, Lancaster Building, High Street.

Norway. — Forsvarets Anleggsdirektorat (FAD), Oslo. 15th October. Electric cables. 1st January. Five 750 kW standby diesel generators and two 2,500 kVA transformers. 1st February. Two 250 kW frequency changers, and two 220 kW rectifiers complete with transformers and switchgear. 1st April. 130 kW frequency changer, 180 kW rectifier and 1,500 kVA transformer, with switchgear. (G.D. 5654/58/2. Ten/34054.)*

Orpington. — U.D.C. 5th September. Group "A" sodium street lighting columns and equipment. Engineer and surveyor, Civic Offices, The Walnuts, High Street.

Philippines.—National Power Corporation, Manila. 10th September. Complete load-end substation and equipment for Amlan River No. 1 hydro-electric project. (E.S.B. 20241/58. Ten/34018.)* 30th September. Duplex control switchboard panel and circuit-breakers for the Magalong substation. (E.S.B. 20165/58. Ten/34019.)*

Rhodesia and Nyasaland.—London Agent of the Rhodesia Railways, 241, Salisbury House, London Wall, London, E.C.2. 2nd October. Private automatic branch exchange. (E.S.B. 19818/58. Ten/33960.)*

Rowley Regis.—Borough Council. 3rd September. Concrete columns, electric lamps and equipment for seven lighting schemes in various parts of the borough. S. G. Wood, borough engineer, Municipal Buildings, Old Hill, Staffs.

South Africa.—Durban Electricity Department. 12th September. Ring main switch and tee-off fuse switch units. (E.S.B. 20200/58. Ten/34034.)*

Surrey.—County Council. 13th September. Street lighting equipment at Gatwick. (See this issue.)

Sutherland.—County Council. 20th September. Trunk road lighting equipment. (See this issue.)

Thailand.—Thai Technical and Economic Committee, Bangkok. 18th September. Electrical equipment for Bangkok electricity works. (E.S.B. 17625/58/I.C.A. Ten/33939.)*

Wellingborough.—U.D.C. 10th September. Supply and erection of 187 tungsten fittings, mounted on concrete columns, for group "B" street lighting. Engineer and surveyor, Council Offices, Swanspool.

ORDERS PLACED

Glasgow.—Education Committee. Electrical installation work, including heating, at primary school, Castlemilk (£10,863).—James Scott & Co. (Electrical Engineers).

London. — Lambeth Borough Council. Supply of 651 street lighting lanterns (£2,094) and 651 mounting boxes and extension pieces (£2,186).—General Electric Co. Erection of 203 lighting units and the supplying and laying of the necessary cables, etc. (£3,760).—London Electricity Board.

Washington (Durham).—U.D.C. Electric street lighting improvement scheme (£3,630). —Revo Electric Co.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aylesbury.—Bungalows (39), with underfloor electric heating, Conventon Road; borough engineer, Friarscroft, 3, Oxford Road.

Biddulph.—Church hall, Knypersley; J. Clarke, architect, 86, Moorland Road, Burslem.

Cardiff. — Medical school for Welsh National School of Medicine, Newport Road; Benson Bros., Ltd., builders, 117, Ashley Down Road, Bristol.

Chipping Norton.—Outpatients' department for War Memorial Hospital; Oxford Regional Hospital Board, 43, Banbury Road, Oxford.

Colchester.—Houses (226), East Hill and West Bergholt; Henry Everett & Sons, Ltd., 70, Barrack Street.

Colne.—Flats (46), Oak Street; T. Rutter, town clerk, Town Hall.

Croydon.—Large development scheme for Mayday Hospital, Thornton Heath (£279,020); South West Metropolitan Regional Hospital Board, 11, Portland Place, W.1.

Cumberland.—Eighteen police houses; county architect, Portland Square, Carlisle.

Doncaster.—Additions to Girls' Technical School (£36,432) and new police garage (£11,134); borough architect, Doncaster.

Dover.—Redevelopment of Buckland Hospital, with two-storey annexe (£90,000); architect to South East Metropolitan Regional Hospital Board, 9, Hallam Street, W.1.

Gateshead.—Houses (200), Leam Lane estate; Gray & Partner, architects, Portland Terrace, Newcastle-on-Tyne.

Jarrow.—Houses (43), Charles Street; H. W. T. Perkins, borough engineer.

Manchester.—Block of flats, Sandy Road, Whalley Range; Arthur R. Johnson, architect, 11, Peter Street.

Middlesbrough.—Houses (29), Easterside; R. H. Bailey & Son, Ltd., builders, Denmark Street.

Newcastle-on-Tyne.—New terminal buildings at Woolsington Airport; city architect, 18, Cloth Market.

Proposed new police headquarters (£80,000); city architect.

Northumberland.—Additions to Hexham County Modern School (£80,000); county architect, County Hall, Newcastle-on-Tyne.

Peterlee.—Health centre (£45,000); M. D. Lilley & Son, builders, Back Woods Terrace, Murton.

Factory and offices for Peterlee Development Corporation, Old Shotton, Peterlee; W. J. Scott, chief architect.

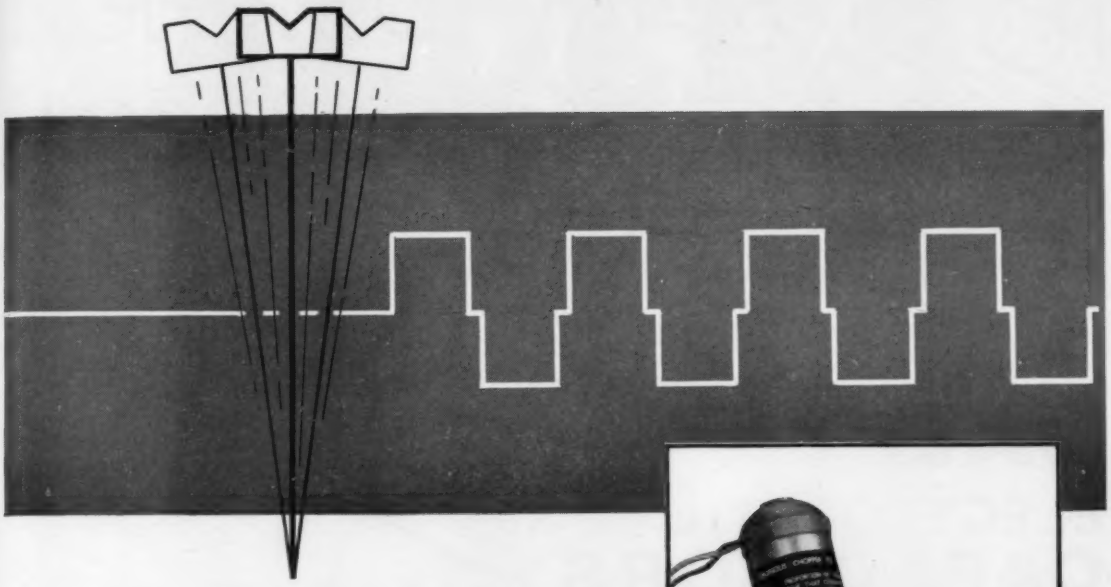
Rogerstone.—Works extensions; Northern Aluminium Co., Ltd.

St. Helens.—Extensions to General Hospital; Quiggin & Gee, architects, 11, Old Hall Street, Liverpool.

St. Neots.—Clinic and physiotherapy centre (£18,012); county architect, Hunts. C.C., Huntingdon.

Wrexham.—Four-storey block at Girls' School and extensions to Boys' School, Grove Park Grammar Schools; R. McFarlane, county architect, Grove Park, Wrexham.

York.—Block of flats, New Earswick; Joseph Rowntree Village Trust, Beverley House, Shipton Road.



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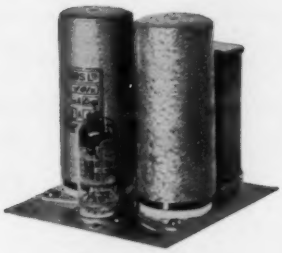

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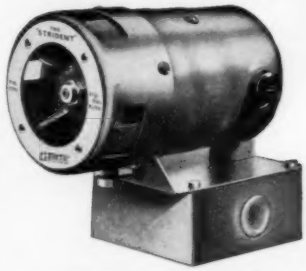

The "STRIDENT" Syren

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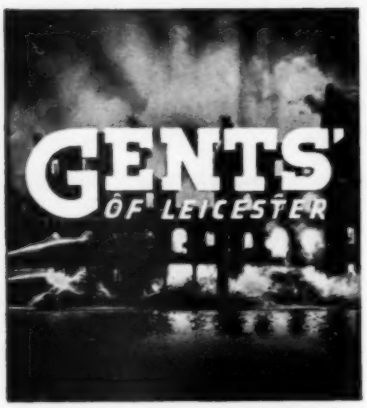

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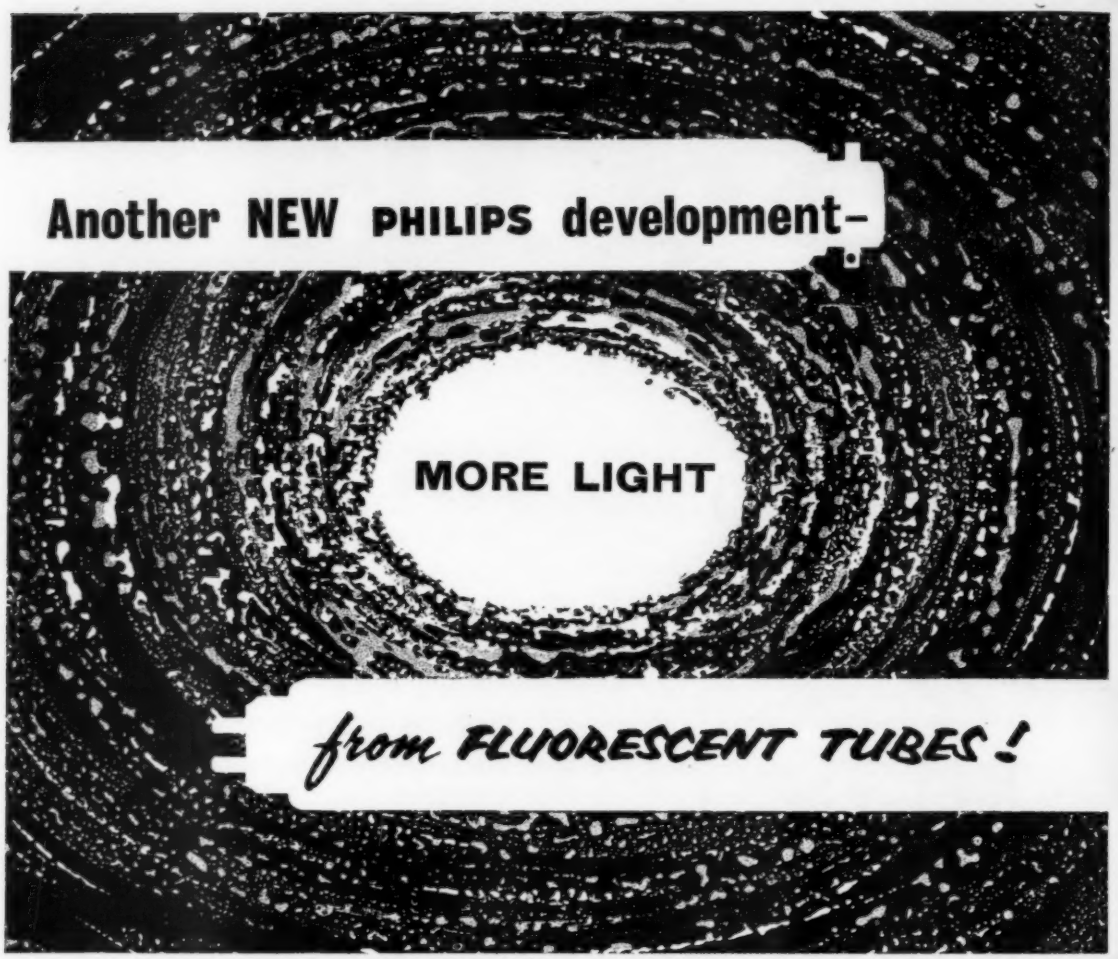

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The table at right shows the initial and "average through life" lumen output for Philips Cool White fluorescent tubes for the more usual ratings. Previous values are shown in brackets. It illustrates the remarkable new increase over levels that were already outstandingly high.

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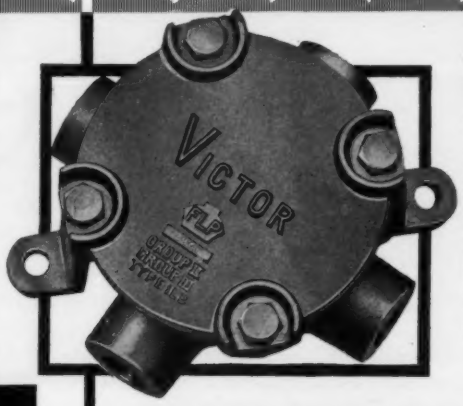

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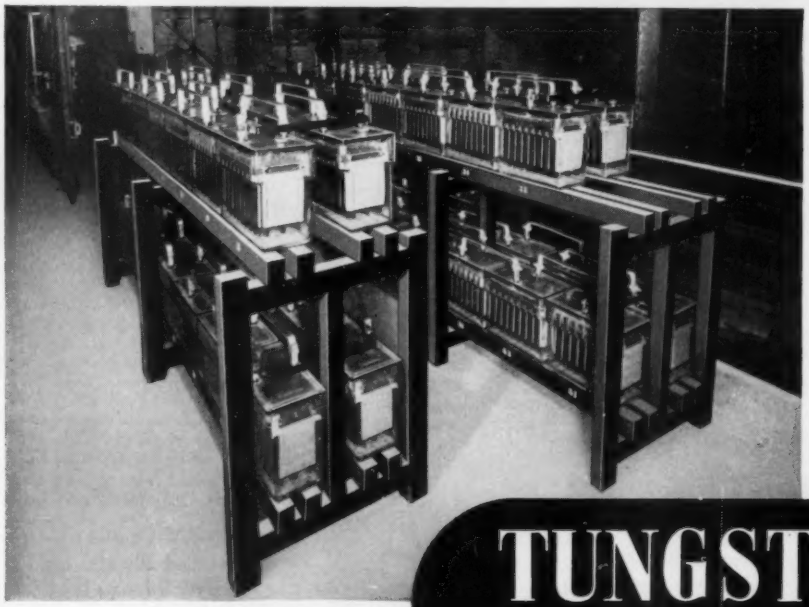

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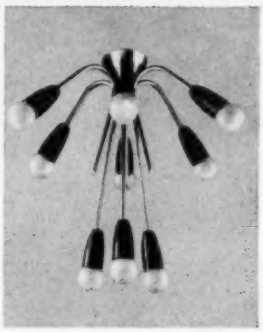

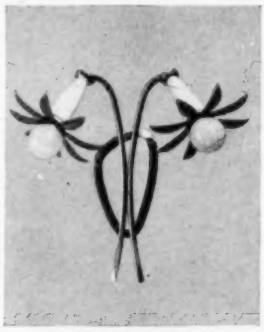

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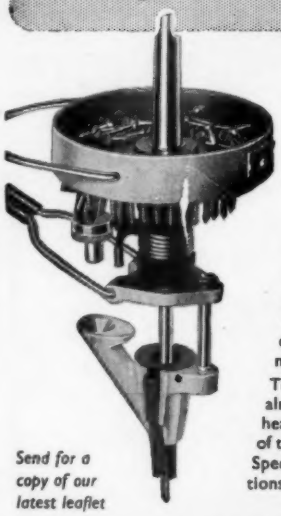

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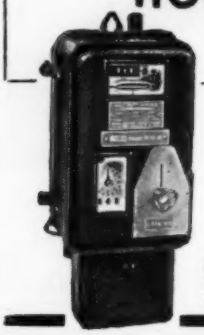

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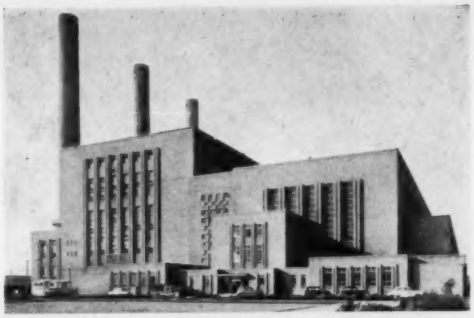

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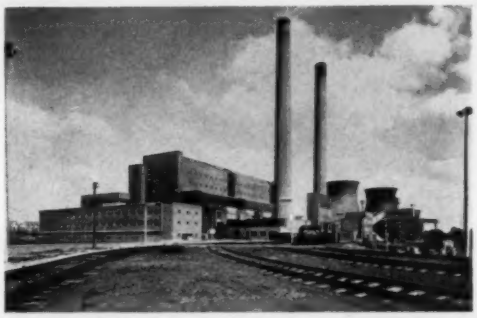

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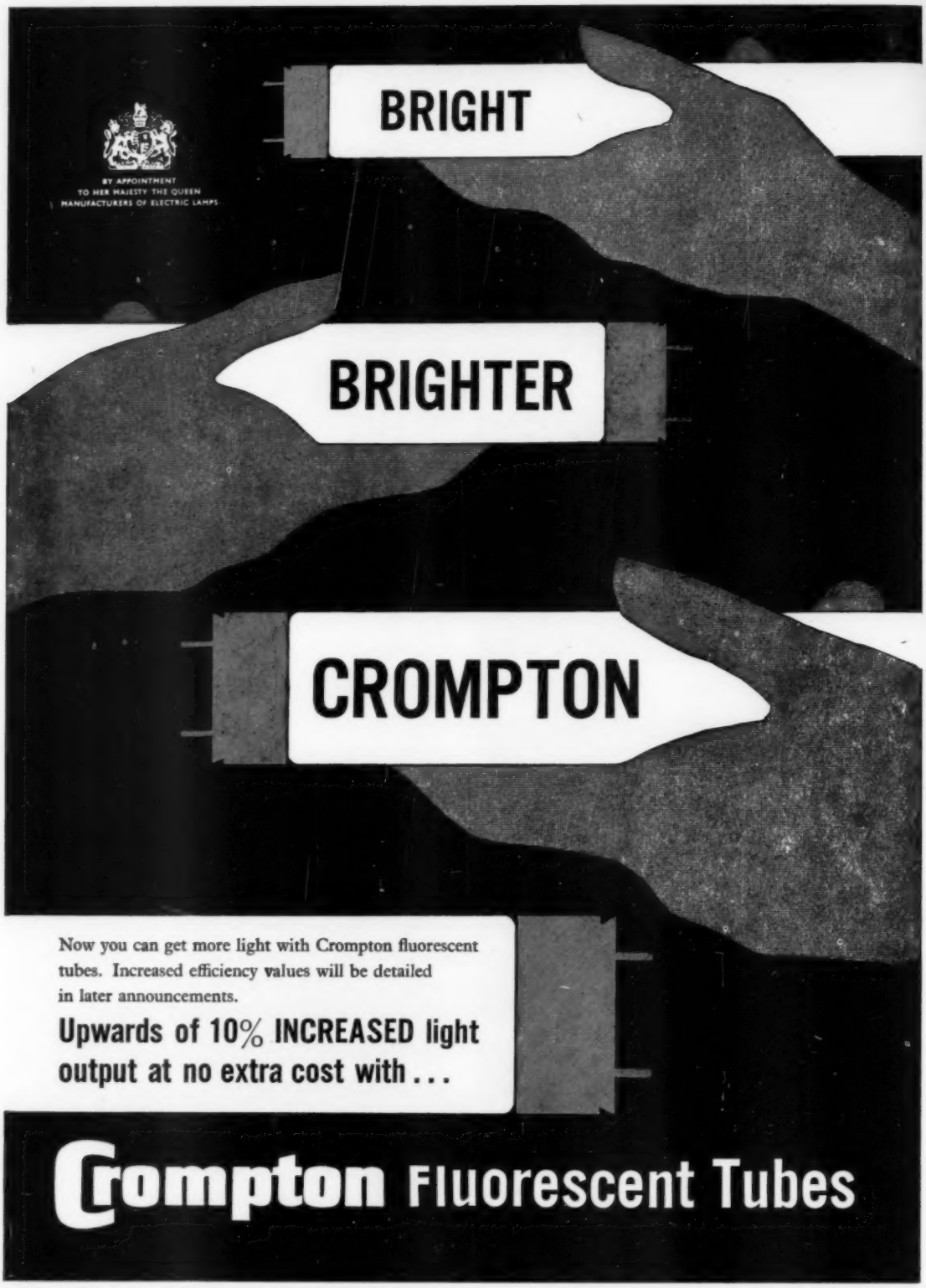
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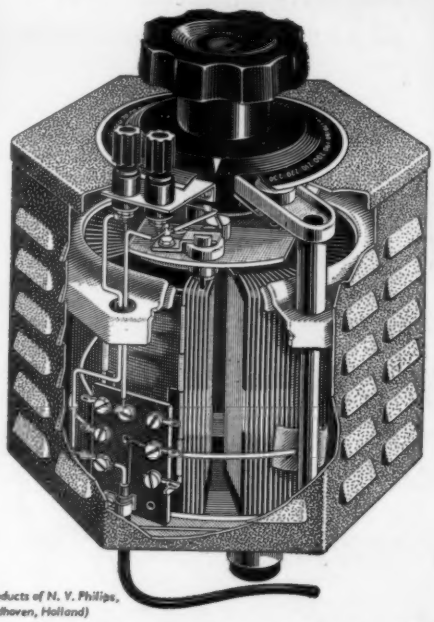

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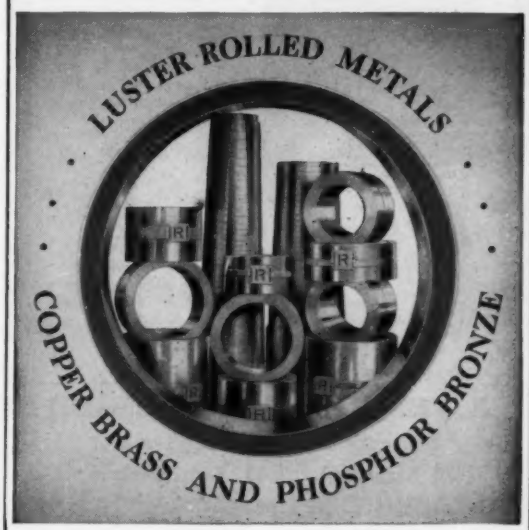

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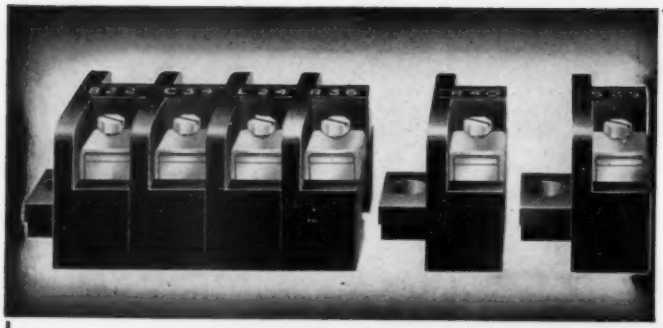

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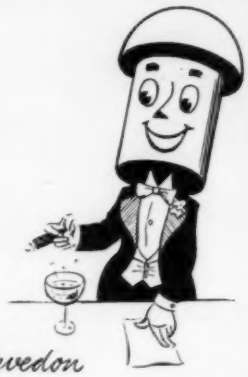

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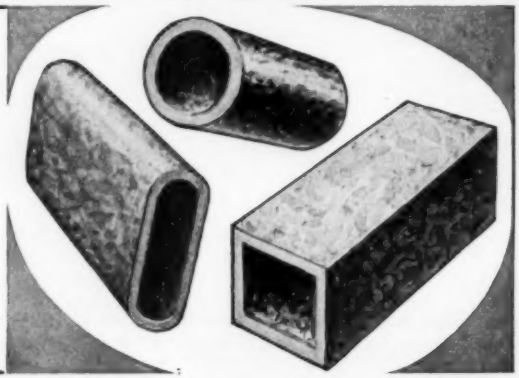

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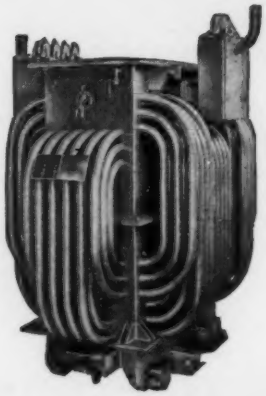

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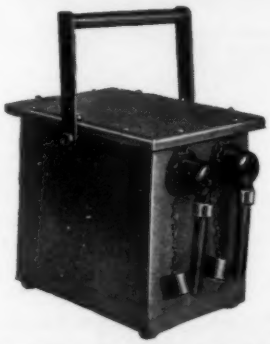

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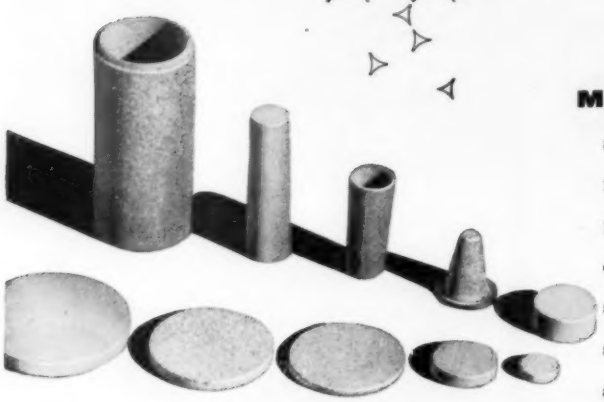

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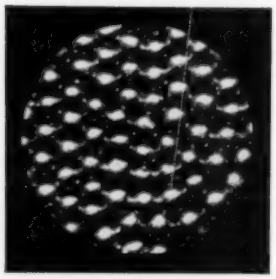

This microphotograph shows a section of a Bound Brook Filter. Note the porous structure formed by the use of spherical metal powder.

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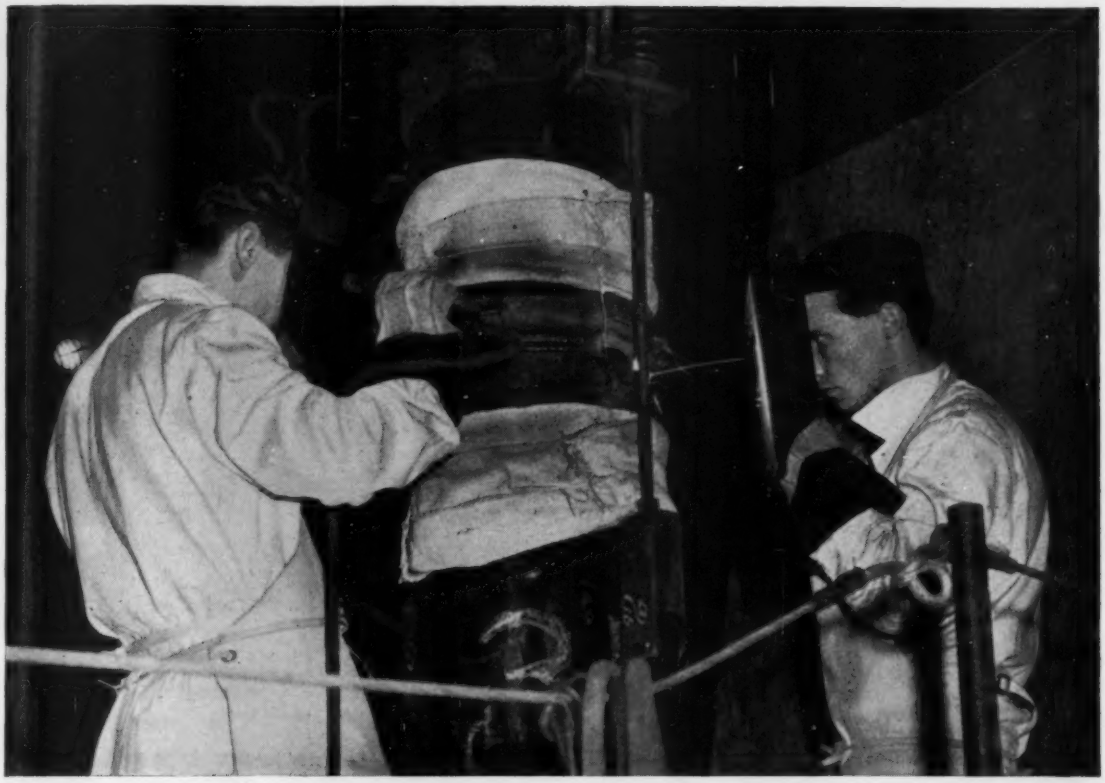

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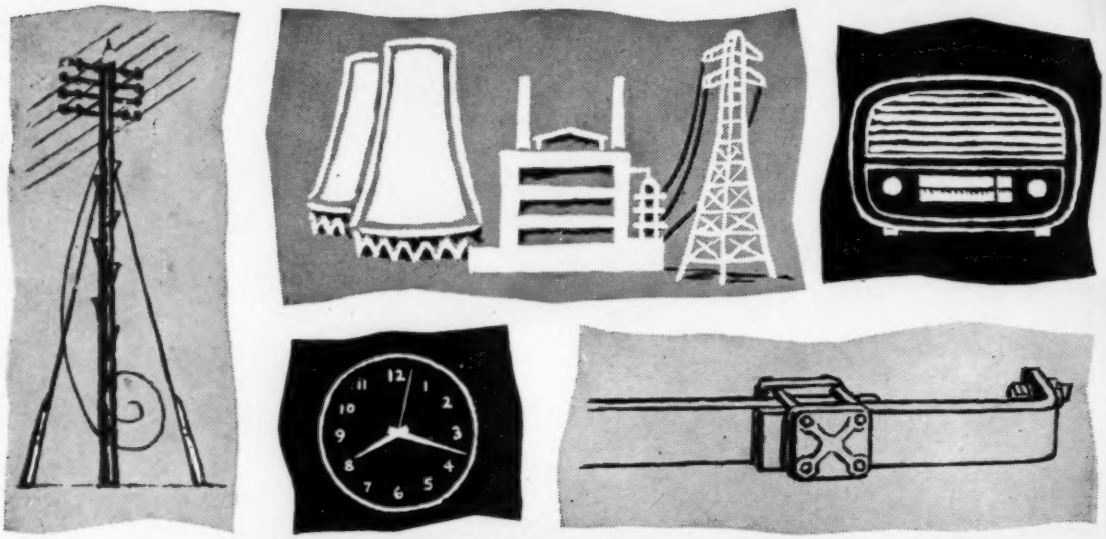

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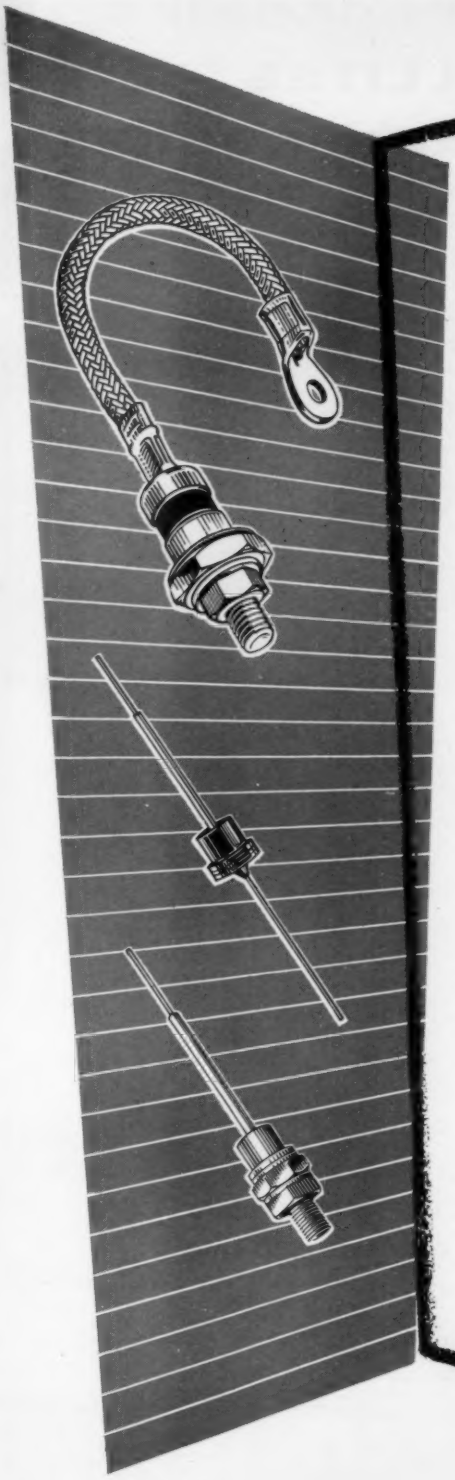

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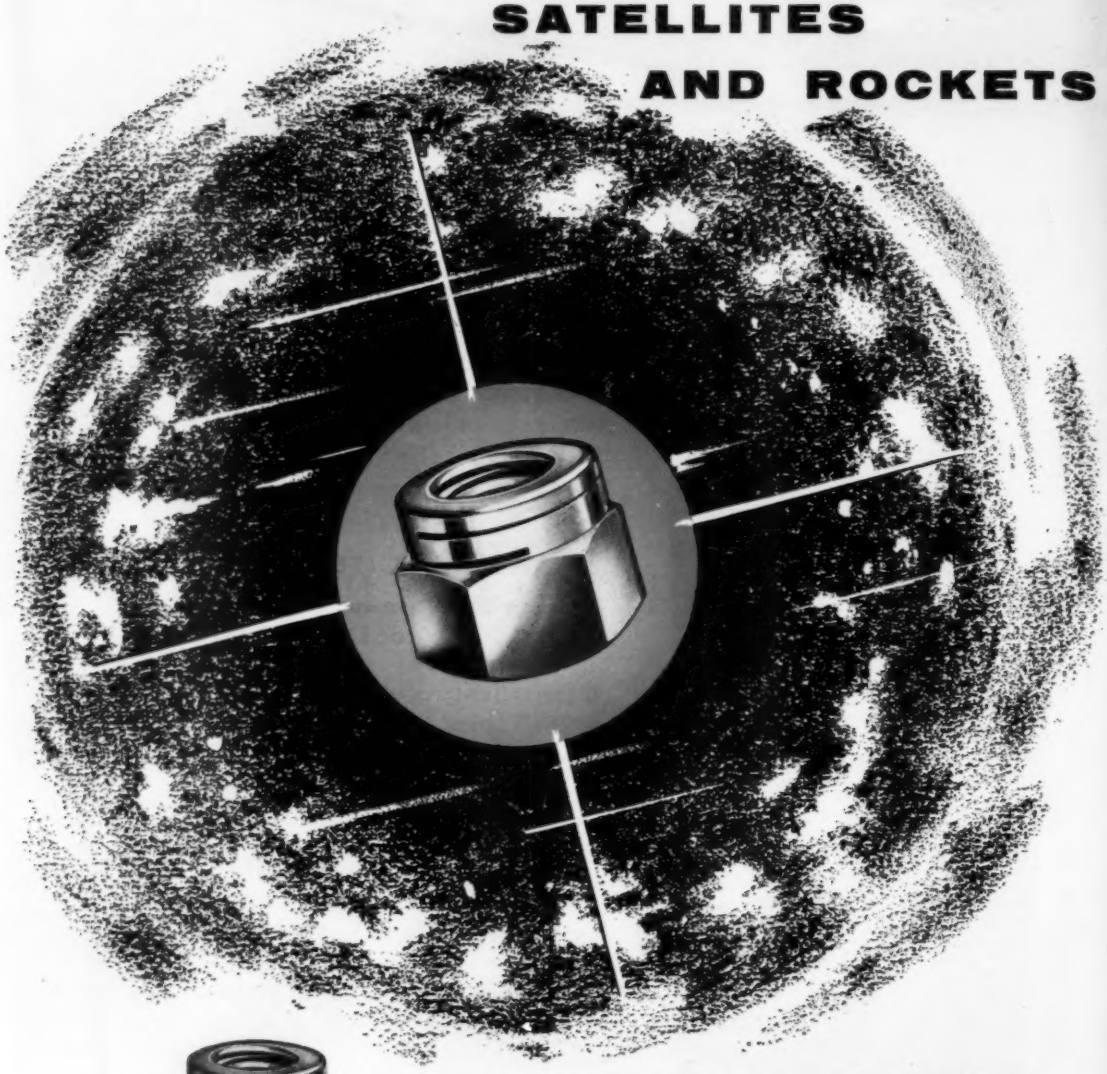

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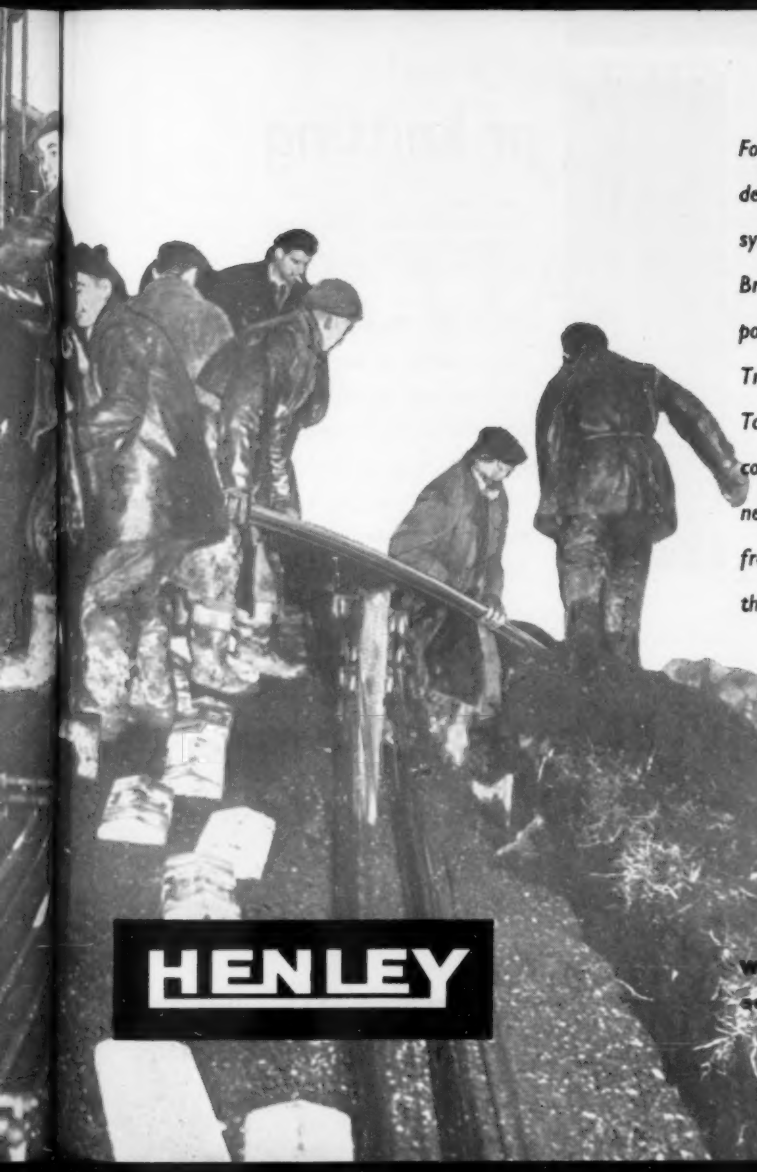

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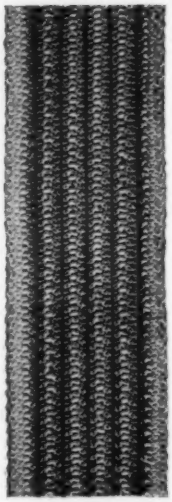

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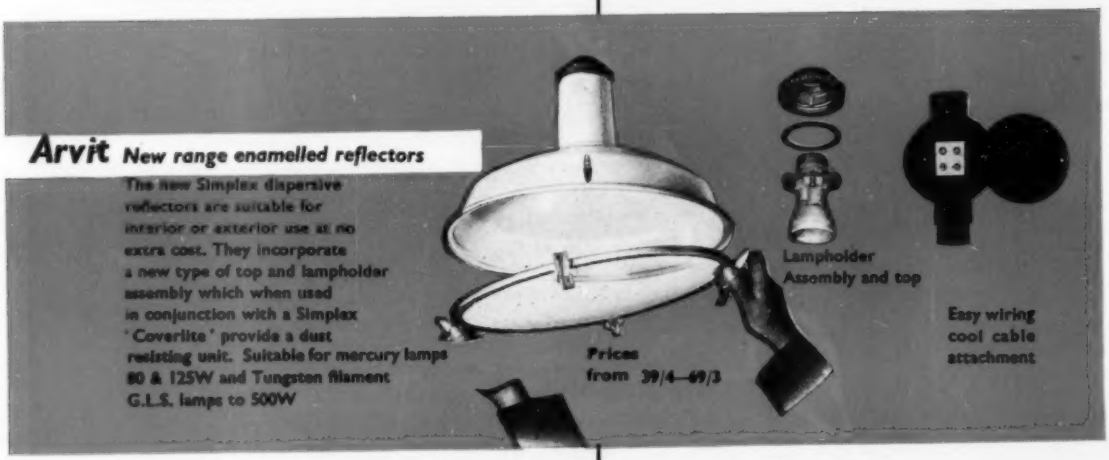
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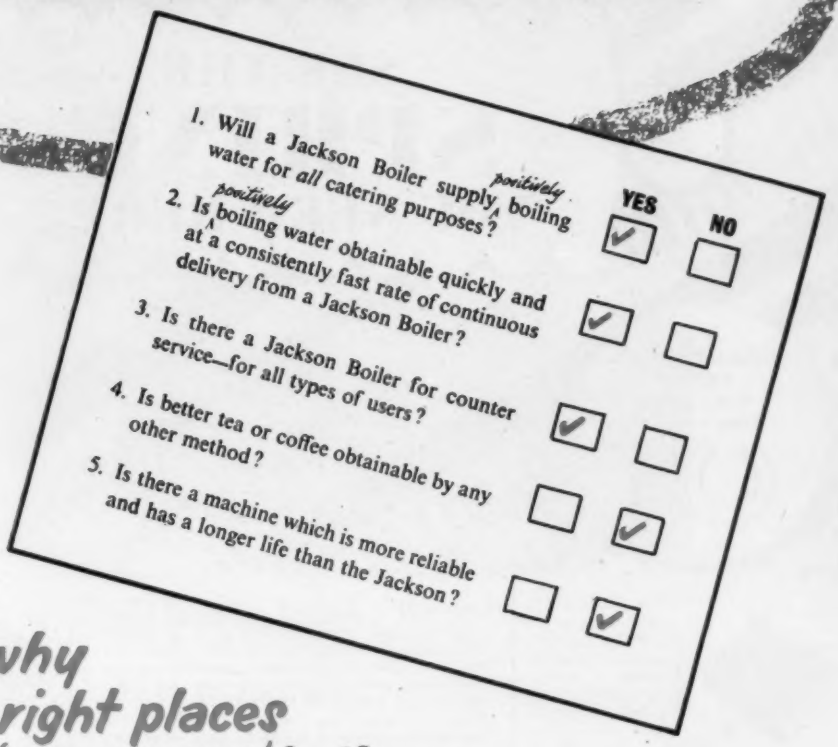
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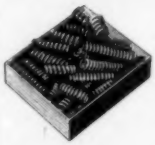

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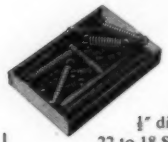

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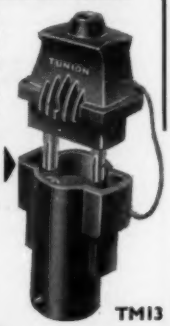

TM13

Further types of adaptors and connectors are shown on pages 22 and 25 of our 34 page illustrated Brochure 1453/ER which also gives details of over 400 Tunion products. A copy will be sent you on request.

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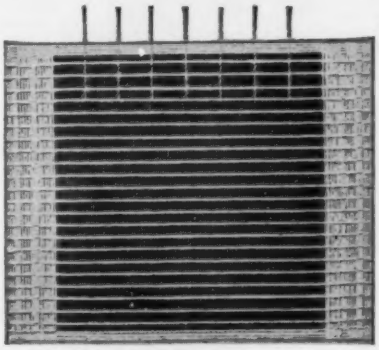

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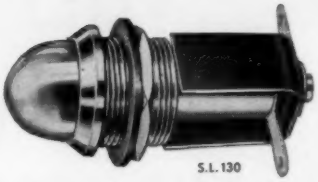
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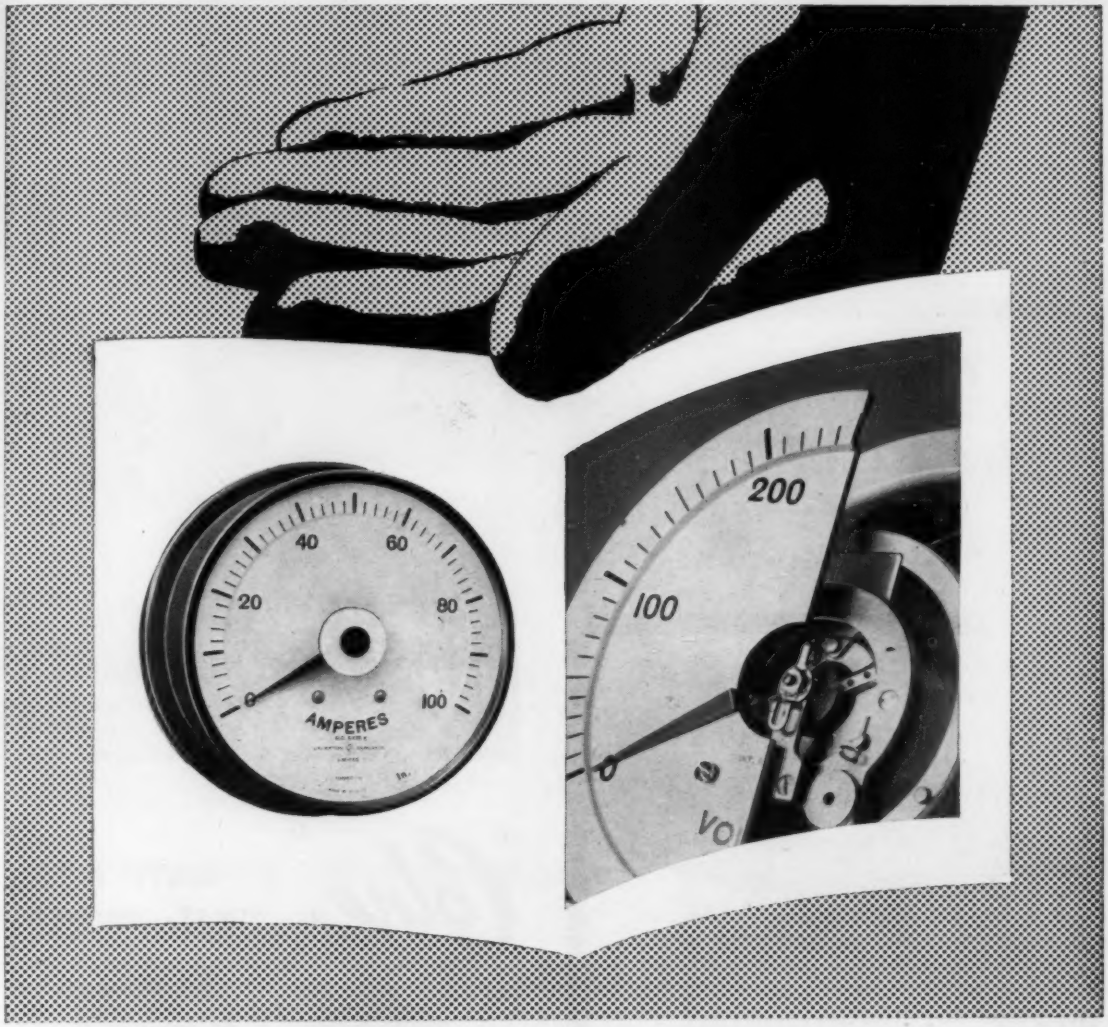

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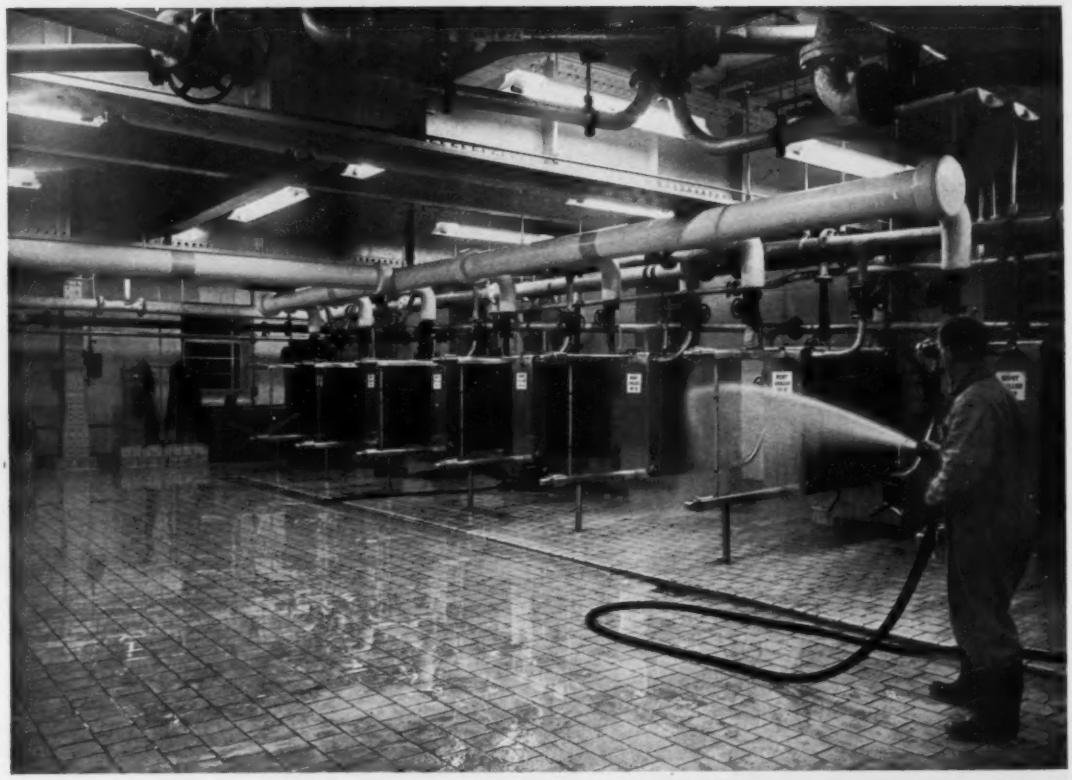
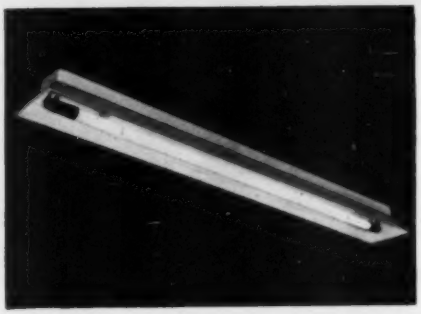


'Perspex' anti-corrosion lighting fittings at Guinness Brewery

OPAL 'PERSPEX' was chosen for this installation of A.E.I. Lamp and Lighting Co. Ltd. 'Watershed' fittings at the Park Royal Brewery of Messrs. Guinness because these fittings must resist the corrosive effects of condensation. In addition, the material chosen had to be one easily cleaned of mould growths which are particularly prevalent in fermenting houses. 'Perspex' is a tough, light material that will last for many years without deteriorating. Designers enjoy working with it because it is easy to shape and offers considerable scope for imaginative design.

'Perspex' is available in clear and opal sheet and also in a wide range of attractive, modern colours.



Opal 'Perspex' reflector anti-corrosion 'Watershed' fittings made by A.E.I. Lamp and Lighting Co. Ltd., 370 of which are installed in Guinness' Park Royal Brewery.

Lighting in breweries must withstand wet atmospheres. Areas are hosed down frequently and steam is used extensively for sterilising pipes and equipment. One reason for the choice of 'Perspex' in these fittings is its ability to withstand these atmospheres.

'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.

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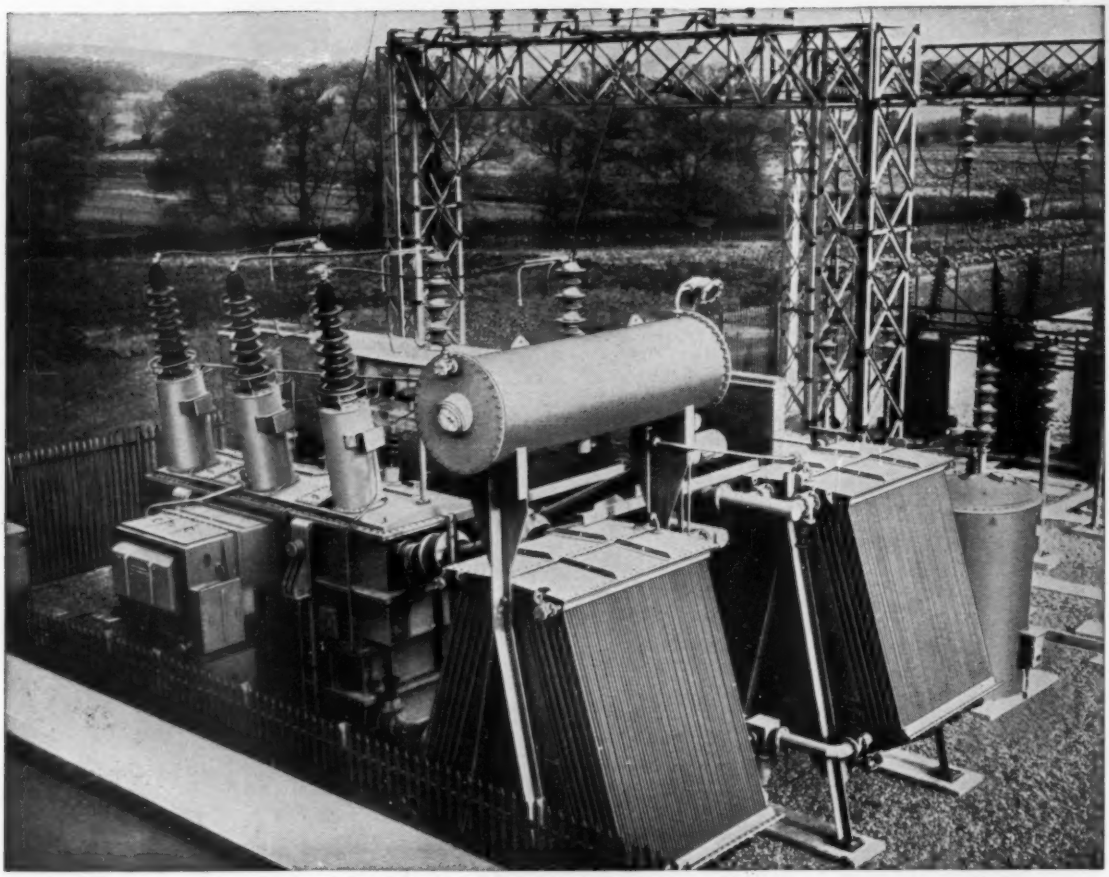

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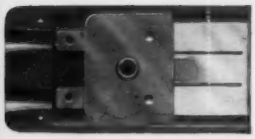

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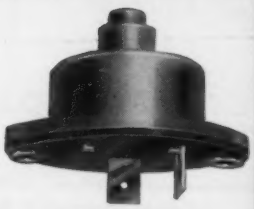

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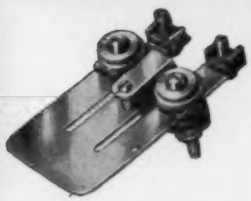

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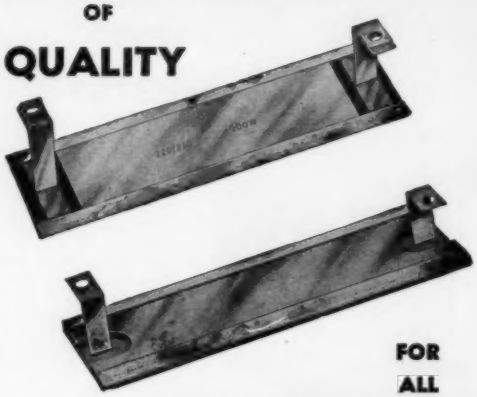

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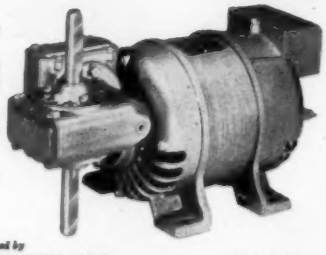

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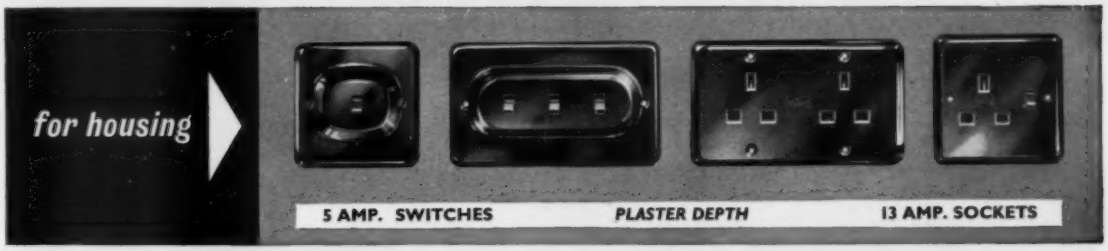

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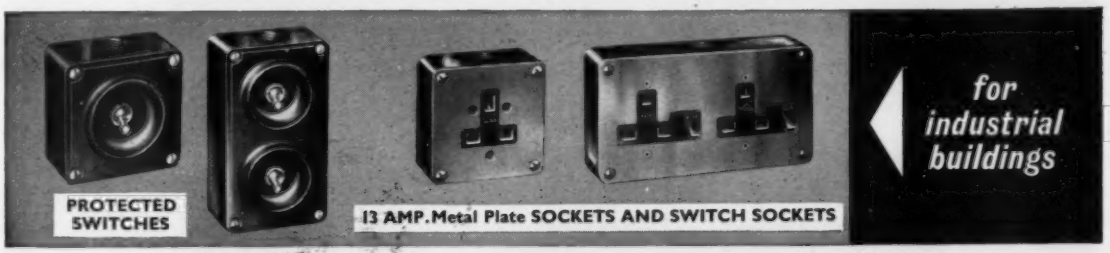

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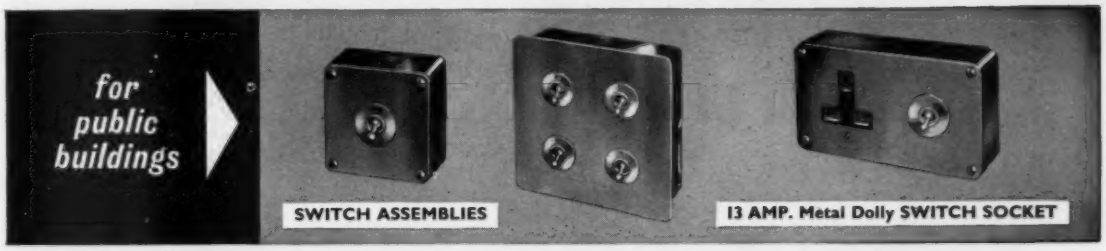

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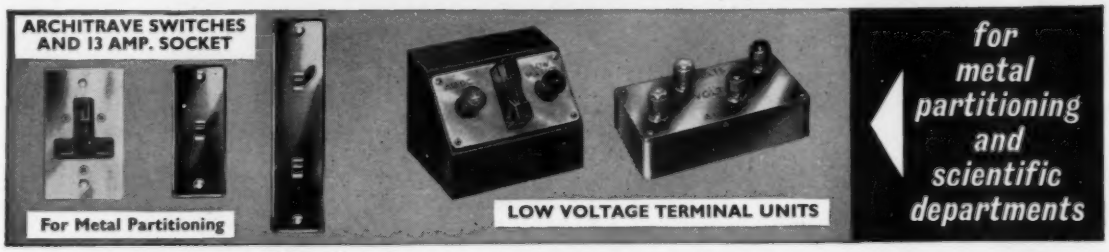
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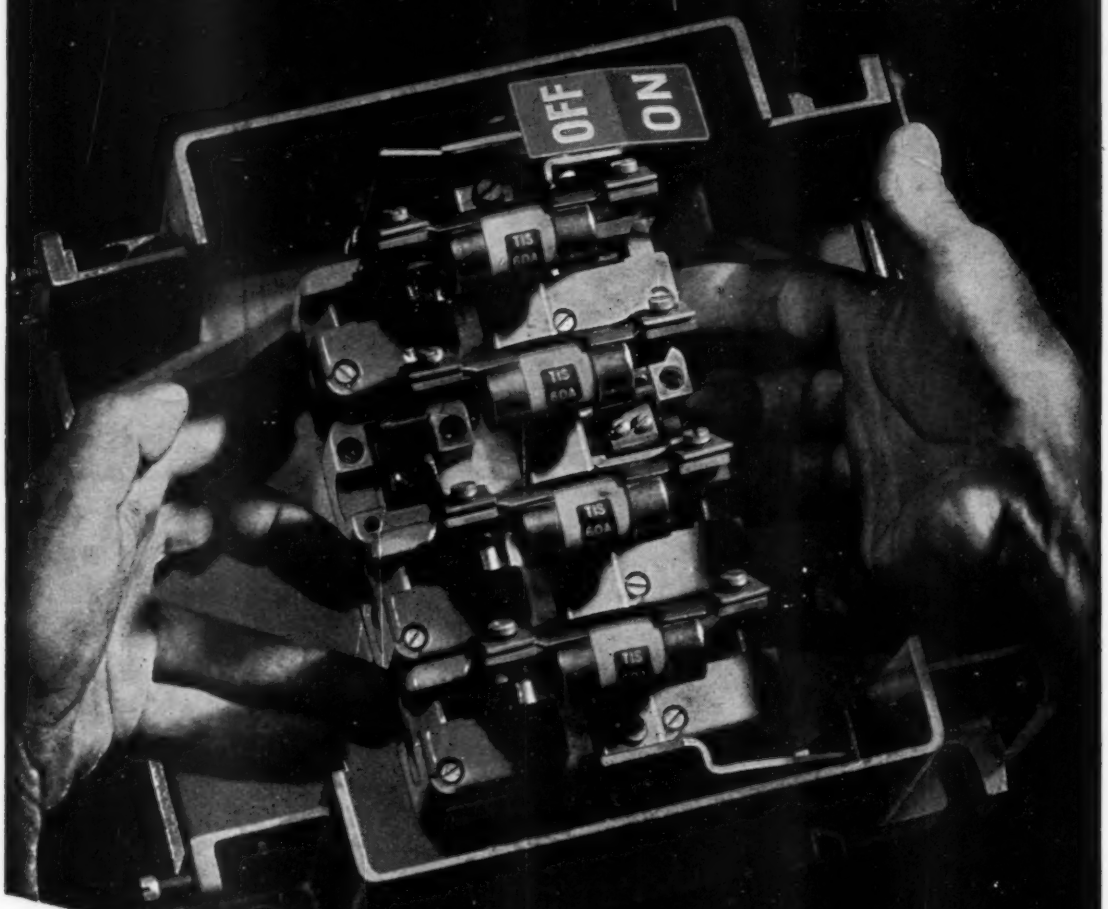

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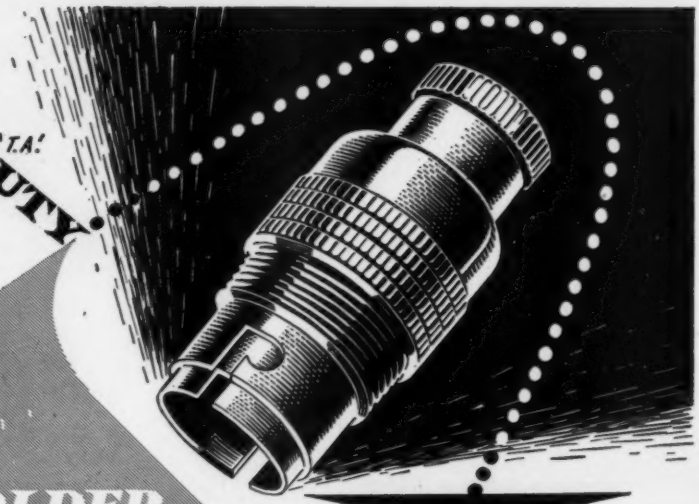

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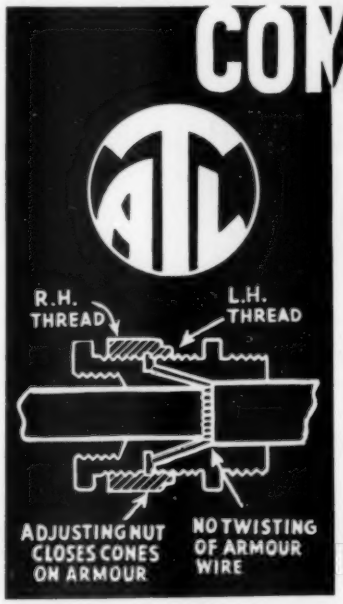

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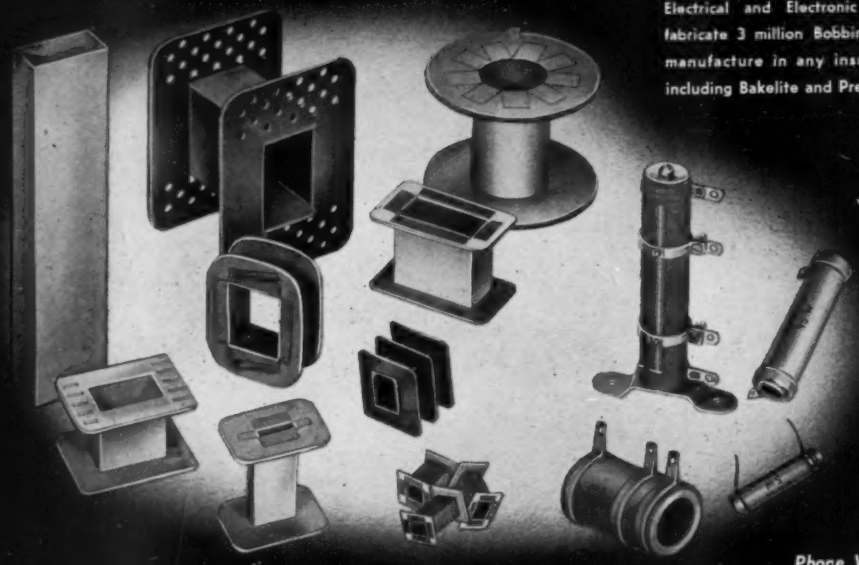

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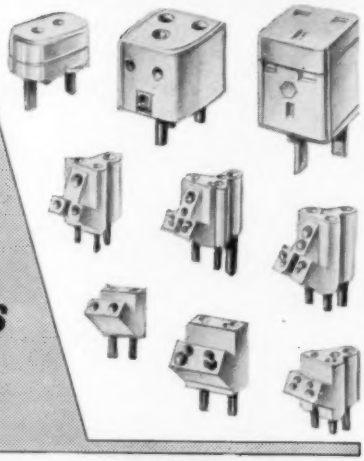

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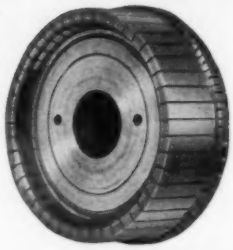

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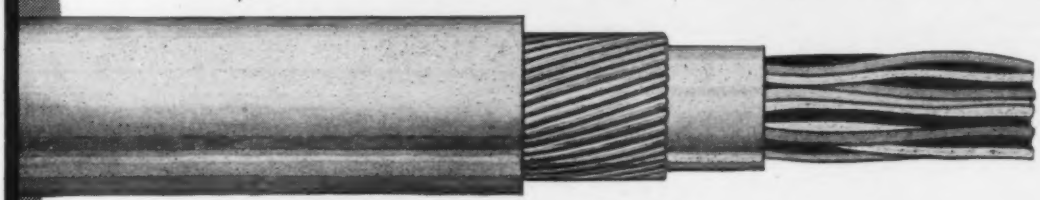
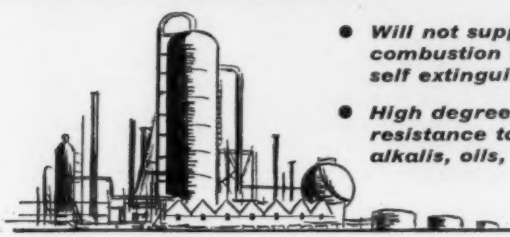
P.V.C. offers many advantages over conventional types of insulation some of which are shown below.





- *Will not support combustion and is self extinguishing.*
- *High degree of resistance to acids, alkalis, oils, etc.*
- *Does not encourage fungus growth or insect attack.*
- *Greater dielectric strength at normal temperatures.*

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, W.C.2

48, NORTH ROW, PARK LANE, LONDON, W.1

REPRESENTATIVE AND WAREHOUSES: Birmingham, Bristol, Dublin, Glasgow, London, Leeds, Liverpool, Manchester, Newcastle, Newport Nottingham, Sheffield, Southampton, Swansea, Belfast (A. W. Gordon, Ltd., Agent).

H

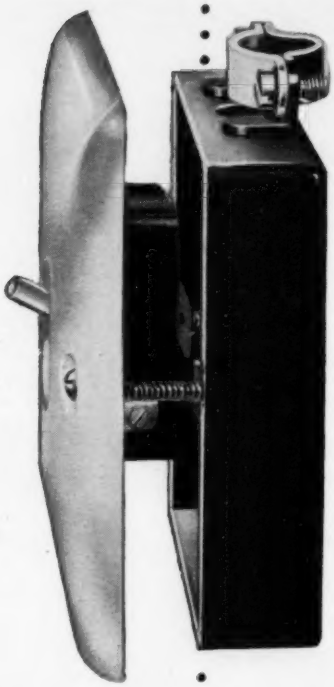
MUTAC SILENT

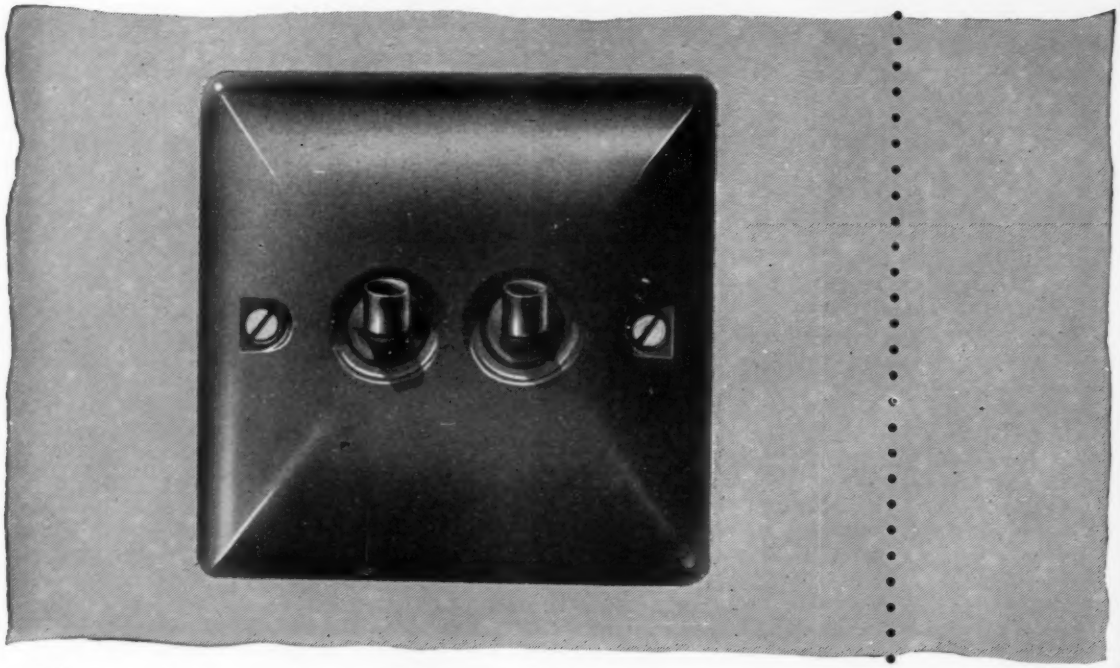
PLASTER DEPTH

SINGLE and TWIN DOLLY

A.C. SWITCHES and SWITCH BOXES

$\frac{7}{16}$" adjustment is provided by the $\frac{3}{4}$" x 4 B.A. screws which are supplied with each switch. Full particulars of these switches and boxes are given in Publication S3716.





for a lifetime of trouble-free service

A G.E.C. PRODUCT

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 2/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

CITY OF CARDIFF

Street Lighting Works

TENDERS are invited severally for the following Street Lighting works:—

1. Supply of 180 Class A Spun Concrete Columns.
2. Supply of 43 Galvanised Prefabricated Brackets for traction poles.
3. Supply of 260 Sodium, 21 Mercury Class A Lanterns and auxiliary gear.
4. Supply of Clockswitches.
5. Erection of 180 Class A Columns.
6. Fixing of Lanterns, Brackets, etc., and wiring through.
7. Removal of obsolete apparatus.

Tenders will be considered for the whole or any portion of the works and the Council does not bind itself to accept the lowest or any tender.

Copies of the form of agreement, conditions of contract and drawings may be inspected at the City Surveyor's Office, City Hall, Cardiff, from whom copies of the specification, bills of quantities and conditions of tender may be obtained upon deposit of £2 2s. for part or £5 5s. for the whole of the works. Cheques should be made payable to Cardiff Corporation General Rate Fund.

Tenders will not be considered unless enclosed in a plain sealed envelope endorsed "Tender for Street Lighting Works," addressed to the undersigned at the City Hall, Cardiff, and delivered by registered post so as to be received not later than the 15th September, 1958.

The envelope must not bear the name of or any mark indicating the identity of the tenderer.

S. TAPPER-JONES,
Town Clerk.

City Hall, Cardiff.
8th August, 1958. 4494

SURREY COUNTY COUNCIL

Highways and Bridges Department

London-Brighton Trunk Road (A.23) Street Lighting at Gatwick

TENDERS are invited for works of Street Lighting to Group A standard, comprising the provision and erection of 55 Tubular Steel Lighting Columns, Lanterns, 140-watt Sodium Vapour Discharge Lamps and ancillary electrical equipment at four sites at Gatwick; all in accordance with the General Conditions of Contract of the Institution of Mechanical Engineers and the Institution of Electrical Engineers.

Plans showing the sites may be inspected at the offices of the County Engineer, County Hall, Kingston-upon-Thames, from whom contract documents and tender forms, returnable by the 13th September, 1958, may be obtained.

4531

BOROUGH OF BATLEY

Street Lighting Department

TENDERS are invited for the supply of Tungsten Lamps and Discharge Lamps. Specification and form of tender may be obtained from the Borough Engineer, Hanover Street, Batley.

Tenders, in a plain sealed envelope (not bearing any name or mark indicating the sender), endorsed "Tender for Electric Lamps," must be delivered to the undersigned not later than Thursday, 28th August, 1958.

The Corporation does not bind itself to accept the lowest or any tender.

L. O. BOTTOMLEY,
Town Clerk. 4512

BOROUGH OF HESTON AND ISLEWORTH

Street Lighting Improvement, Hayes Road

TENDERS are invited for the installation of Street Lighting in Hayes Road and North Hyde Road from the Grand Union Canal Bridge to the River Crane Bridge, including providing and erecting 9 Group A Columns with 140-watt Sodium Vapour Lanterns and Lamps and 21 Group B Columns with 60-watt Sodium Vapour Lanterns and Lamps.

On deposit of £2 2s. (returnable if a bona fide tender is received and not subsequently withdrawn) the tender documents may be obtained from and the conditions of contract and drawings seen at the Borough Engineer's Office, 88, Lampton Road, Hounslow.

Tenders, in sealed envelopes endorsed "Tender, Hayes Road Lighting," but not indicating the sender, must be delivered to me by 10 a.m. on the 10th September, 1958.

The Council are not bound to accept any tender.

D. MATHIESON,
Town Clerk.

Town Hall,
Hounslow. 4530

CHESHAM URBAN DISTRICT COUNCIL

Public Lighting, A.416

TENDERS are invited for the supply and erection of 61 Steel Group A Lighting Columns fitted with 250-watt Colour Corrected Mercury Vapour Lanterns, with all lamps and control gear.

Specifications and bills of quantities may be obtained and conditions of contract and layout drawings inspected at the office of the Engineer and Surveyor to the Council on payment of £1 1s. deposit, which will be returned on receipt of a bona fide tender.

Tenders in plain sealed envelopes bearing the words "Street Lighting A.416" must be received by me not later than Friday, the 5th September, 1958.

The Council do not bind themselves to accept the lowest or any tender.

W. I. NASH,
Clerk to the Council.

Council Offices,
Chesham, Bucks. 4445

COUNTY COUNCIL OF SUTHERLAND

Street Lighting, Brora Trunk Road, A.9

TENDERS are invited by the above Local Authority for the supply and erection of 38 Street Lighting Units complete on Trunk Road A.9 within the Special Lighting District of Brora.

Specifications may be obtained from Edward W. Brannen, L.R.I.B.A., F.R.I.A.S., County Architect, Dornoch.

Relative drawings may be seen at the County Architect's Office, Dornoch.

Tenders to be lodged with the undersigned not later than 12 o'clock noon on Saturday, 20th September, 1958.

The Council do not bind themselves to accept the lowest or any tender. Tenders must remain open for acceptance by the Council for a period of three calendar months from date thereof.

A. J. MACRAE,
County Clerk.

County Offices, Golspie.
12th August, 1958. 4511

CLASSIFIED ADVERTISEMENTS ARE PREPAID

BOROUGH OF NEWARK-ON-TRENT

Street Lighting

TENDERS invited for supply and erection of 36 (Stanton) Concrete Columns with "Revo" Enclosed Lanterns for 150-watt Tungsten Lamps and 34 "Holophane" Side of House Lanterns.

Conditions of contract, specification and form of tender from Borough Surveyor, Municipal Buildings, to whom tenders in plain sealed envelopes, endorsed "Group B Lighting, Contract No. 3," should be delivered by 15th September, 1958.

The Council does not bind itself to accept the lowest or any tender.

J. H. M. GREAVES,
Town Clerk.

Municipal Buildings,
Newark-on-Trent.
14th August, 1958. 4529

SITUATIONS VACANT

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

Third Assistant District Engineer, Southern District

APPLICATIONS are invited for the above position. Candidates should have a sound engineering training and subsequent experience with H.V. and L.V. underground distribution systems, including the operation and maintenance of H.V. and L.V. switchgear and cables, and a knowledge of protective gear and fault location.

The possession of the Higher National Certificate or equivalent qualification is desirable.

Salary scale £835/£880 per annum, Class G, Grade 9.

The successful candidate will require to reside within a reasonable distance of District Headquarters.

The position is superannuable and the conditions of employment will be in accordance with the National Joint Board Agreement.

Applications, on the appropriate form, which may be obtained from the undersigned, should be completed and returned within 21 days of the appearance of this notice.

A. KELSO,
Manager.

P.O. Box 6,
75 Waterloo Street,
Glasgow, C.2.
12th August, 1958. 4518

LONDON ELECTRICITY BOARD

Senior Draughtsman

APPLICATIONS are invited for the above position in the Board's West End District at Victoria, London, S.W.1.

Applicants should have had a good general and technical education to Ordinary National Certificate standard; be capable of supervising draughtsmen, and have had general engineering experience including layout of electrical plant and cabling, with a knowledge of building construction.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 5, £800 to £910 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 8th September, 1958. Please quote reference PER/V/2512/R.

4514

Situations Vacant (continued)

SOUTH WESTERN ELECTRICITY BOARD

Senior Assistant Engineer, Supply Section

Chief Commercial Officer's Department, Area Headquarters, Bristol

APPLICATIONS are invited from suitably qualified and experienced persons for the above appointment.

Salary according to Grade 3, Class AX/CX, £1,330-£1,455-£1,525 per annum of the N.J.B. Agreement.

The candidate appointed will report directly to the Assistant Chief Commercial Officer (Supply) on the work of the section, and particularly in the following fields :—

1. Terms and conditions of supply (other than tariffs).
   (a) Connection charges.
   (b) Housing estate supplies.
2. Rural development.
   (a) Line rental scheme.
   (b) Rural development contribution scheme.
   (c) Rural survey.
   (d) Rural programme.
   (e) Statistics.
3. Technical Services.
   (a) Development of space heating, including off-peak loads.
   (b) Appliance and method development aspects of utilisation research.
   (c) Technical responsibility for test house.
4. Commercial aspects of the Board's capital budget.

Candidates should have wide experience of the type of work described and should be able to prepare concise reports having given objective consideration to the problems presented to them.

Corporate Membership of the Institution of Electrical Engineers or possession of equivalent technical qualifications is desirable.

Applications to be made on official form obtainable by postcard only from Deputy Secretary, South Western Electricity Board, Room 341, Electricity House, Colston Avenue, Bristol, 1, quoting reference O/B3/4. Closing date for receipt of completed applications is 6th September, 1958. 4534

JOSEPH LUCAS (ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

SENIOR DESIGN DRAUGHTSMEN

MORPHY-RICHARDS Ltd., St. Mary Cray, Kent require two men to work in a development department engaged on original design. Age 30 or over, experience in light engineering and/or domestic appliance field essential, H.N.C. standard preferred. These appointments offer a good salary in addition to annual profit sharing bonus. The factory is close to St. Mary Cray Station which is easily reached from Victoria or Holborn Viaduct. Evening interviews if preferred.

Please write or telephone P. D. Nunn, Orpington 27000. 4550

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (Mechanical Maintenance), BARKING "A/B" POWER STATION (Vacancy No. 58/621).

Applicants should have had considerable experience with the mechanical maintenance and overhaul of large turbo-alternators, P.F. and chain grate boilers and auxiliary plant. Salary Class L, Grade 9 = £1,115 p.a.

ASSISTANT SHIFT CHARGE ENGINEER, BARKING "C" POWER STATION (Vacancy No. 58/622).

Extensive experience necessary in operation of modern high-pressure turbine and boiler plant, E.H.T. switchgear and in administration and control of labour. Preference given to those with P.F. experience. Salary Class J, Grade 8 = £1,045 plus £99 10s. shift p.a.

ASSISTANT ENGINEERS (Maintenance), BELVEDERE POWER STATION (Vacancy No. 58/623).

Applications are invited from qualified engineers with mechanical and/or electrical experience for three new appointments as Assistants to the Maintenance Superintendent. Each engineer will have opportunities for obtaining experience and knowledge of turbine, boiler and electrical plant, and be ultimately responsible for the planning and supervision of the maintenance of 60-MW and 120-MW boiler/turbine units and auxiliary equipment. Salary Class L, Grade 8 = £1,210 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 31st August, 1958. 4515

CENTRAL ELECTRICITY GENERATING BOARD

HEALTH PHYSICISTS for Nuclear Power Stations required at Bradwell (Essex) and Berkeley (Glos). Successful candidates will have responsibility for radiological measurements in and around the station to which they are appointed and for personnel safety. Good scientific qualifications are required, preferably of degree standard, and some industrial experience in a responsible position would be an advantage.

Specialised knowledge of Health Physics is not essential as the successful candidates will be given an adequate course of training, expected to begin in November, 1958, and last approximately nine months.

Salaries within range £1,560-£1,665 p.a.

Applications, stating age, qualifications, experience, present position and salary, should be forwarded to I. G. Ellis, Personnel Officer, 24/30, Holborn, London, E.C.1, by 1st September. Please mark envelopes "Confidential," and quote ref. E.R./241. 4533

JOSEPH LUCAS (ELECTRICAL) LIMITED

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

125

EAST MIDLANDS GAS BOARD

Lincolnshire Division

Divisional Engineering Assistant

APPLICATIONS are invited from suitably qualified candidates for the above appointment at Divisional Headquarters, Lincoln.

Applicants should have served a recognised apprenticeship in the gas industry, and have had experience of the layout and installation of new plant. Site experience in the constructional field would be desirable.

A degree in engineering (Civil, Mechanical or Electrical) and/or corporate membership of one of the Engineering Institutions would be an advantage.

The salary for the post will be within Grades A.P.T. 10/12 of the National Salary Scales for Gas Staffs (£860/£1,070). The initial placing will be dependent upon the qualifications and experience of the successful candidate.

The post is pensionable and the successful applicant will be required to pass a medical examination.

Applications, giving details of age, education, qualifications and training, together with the names and addresses of two referees, should be addressed to reach the undersigned not later than the 8th September, 1958.

BERNARD CLARKE,
Divisional General Manager.

Belle Vue House,
Carline Road,
Lincoln. 4554

THE NUCLEAR POWER PLANT COMPANY LIMITED

requires

ENGINEERS

to commission Nuclear Power Stations.

Applicants should have had considerable experience in operation of conventional power stations.

The successful candidates will receive extensive "nuclear" training.

The company operates a contributory pension scheme and assistance with house purchase is given to married men.

Applications giving age, qualifications and experience should be sent to—

The Secretary
The Nuclear Power Plant Co. Ltd.
Booths Hall
Knutsford, Cheshire

quoting reference ER/CMS/55

4513

ELECTRICAL DESIGNER

APPLICATIONS are invited for an ELECTRICAL DESIGNER with experience in the design of A.C. motors up to 3.3 kV.

This is a permanent post, also offering excellent experience and varied work other than machine design to man who is capable of accepting responsibility and working with minimum supervision.

Salary commensurate with experience and technical qualifications.

Box 4486.

BERMUDA ELECTRIC LIGHT COMPANY LTD.

THE company have the following vacancies:

(1) ELECTRICAL FITTER for general substation work at all voltages from 110 to 22,000 volts. Experience in the public electricity supply industry required with skilled knowledge of installation and maintenance of high and low voltage switchgear, transformers, etc. Experience in the installation and testing of protective gear an advantage. Quote Ref. 2203/62.

(2) ELECTRICAL FITTER fully experienced in the installation and maintenance of industrial electrical machinery, both A.C. and D.C. Ability to locate and repair faults on such machinery, including elevator installations and ship's electrical equipment. Quote Ref. 2203/63.

(3) ARMATURE WINDER fully experienced in the winding of all types of A.C. and D.C. motors from 0.25 h.p. to 30 h.p. Quote Ref. 2203/64.

(4) REFRIGERATION MECHANIC experienced in the installation and maintenance of air conditioning and chill room refrigeration, including hermetically sealed units. Detailed knowledge of the servicing of such equipment is necessary. Quote Ref. 2203/65.

Three-year contracts offered in first instance. Assistance will be given by the company to find unfurnished accommodation if necessary. Preference will be given to single or married men without children. Pension scheme operated.

Applicants should forward full details of themselves, their training and experience to Messrs. Mackness & Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1, quoting the reference number of the post for which they are applying.

4543

TRANSFORMER DESIGNERS

GRESHAM TRANSFORMERS Limited have a vacancy for a SENIOR TRANSFORMER DESIGNER, fully experienced in the design of power and distribution transformers up to 10 MVA, 66 kV. This is an expanding company with an increasing business in this field, and the position offers considerable scope for initiative.

There are also vacancies for JUNIOR DESIGNERS.

Write initially, with full details of experience, to :—

Chief Engineer
GRESHAM TRANSFORMERS LIMITED
Twickenham Road, Hanworth, Middlesex

4538

SOUTHERN ELECTRICITY BOARD

Installation Engineer

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 7 (£885 × £15-£930 per annum). N.J.B. conditions of service.

Applicants should be qualified to accept responsibility for all installation and maintenance work in the District and its Branch, and to collaborate with the Development Engineer and District Commercial Engineer in the preparation of estimates for contracting work, particularly those of an exceptional nature. The duties will also extend to Branches.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him in envelopes suitably endorsed, quoting Z.938, not later than 1st September, 1958.

4553

GHANA PUBLIC SERVICE COMMISSION

APPLICATIONS are invited for the following vacancies in the ELECTRICITY DEPARTMENT :—

STATION ENGINEERS : To work under an Electrical Engineer in larger electricity undertakings, or to assume responsibility for smaller undertakings.

Candidates should be at least 29 years of age and of good general education. Must have served a recognised apprenticeship of at least 5 years in mechanical or electrical engineering and (a) have thorough knowledge of A.C. overhead and underground transmission and distribution, substations, transformers and switchgear up to 11,000 volts and of wiring, or (b) have thorough practical knowledge of compression-ignition oil engines generating between 100 and 1,500 kW. Salary in range £1,040-£1,280 per annum.

Appointment on contract for two tours each of 18-24 months duration. Gratuity at rate of £12 10s. for each completed month of residential service payable on completion of contract. Outfit allowance of £60 on first appointment. Free first class passages for officer, wife and up to 3 children under 18 years, and in addition an education allowance for children when not resident in Ghana of £100 a child for up to 3 children under 18 years. Generous home leave on full pay. Income tax at low local rates. Preservation of superannuation or pension rights, where applicable, can be arranged.

For further particulars and application form write, stating age, qualifications and experience, to THE DIRECTOR OF RECRUITMENT, GHANA HIGH COMMISSSIONER'S OFFICE, 13, BELGRAVE SQUARE, LONDON, S.W.1.

4498

ENGINEERING CADET EXECUTIVES

The Ahmedabad Electricity Co. Ltd.
The Surat Electricity Co. Ltd.
Bombay Suburban Electric Supply Ltd.

APPLICATIONS are invited from Indian Nationals for appointment as CADET EXECUTIVES in the Electricity Undertaking managed by Messrs. Killick Industries Limited, of Bombay, India.

Candidates must be graduates in electrical or mechanical engineering, preferably being not less than a graduate member of one of the major engineering institutions, and should have had at least two years' practical experience. Age not above 30.

Selected candidates will be under special training for a period of not less than 3 years, during which time they will be in receipt of a basic salary of Rs. 500/- per month, with annual increments of Rs. 35/-. House and travelling allowances will be paid, as also dearness allowance as applicable from time to time. (Cadets will qualify for P.F. benefits after six months from the date of joining). After satisfactory completion of training, cadets will be eligible for appointment to responsible covenanted posts in the undertakings.

Applications stating age, qualifications, experience, etc., should be forwarded in duplicate to Messrs. Baldwin & White, 16/17, Devonshire Square, London, E.C.2, and marked "CADET EXECUTIVE" on the envelope.

4537

ATOMIC POWER CONSTRUCTIONS LTD.

require

SENIOR ELECTRICAL DRAUGHTSMEN

OPPORTUNITIES have arisen for Senior Electrical Draughtsmen who are interested in entering the rapidly developing field of Nuclear Energy, and wish to take part in the electrical design of Nuclear Power Stations.

Positions are vacant for men experienced in the following :—

Plant Layout.
Cable System Design and Installations.
Control Systems and Diagrams.

The work is interesting and varied and good salaries will be paid to the right men.

Applications giving details of age, qualifications, experience, etc., should be sent to :—

The Secretary (Ref. 19/ER)
Atomic Power Constructions Ltd.
28, Theobalds Road, London, W.C.1

4500

B I C C

MECHANICAL ENGINEER, age 25/35, of graduate or equivalent status, for design and development work in the capacitor field. Problems associated with the hermetic sealing of bushing terminations and containers, and the design of terminations and bushings from the point of view of withstanding high electromagnetic stresses would be involved.

PHYSICIST or ELECTRICAL ENGINEER, age 25/35, of graduate or equivalent status, for general study of the thermal performance of capacitor designs, together with work on the detection and evaluation of ionisation in paper impregnant systems under electrical stresses.

GRADUATE ELECTRICAL ENGINEER, age 25/30, for development work in connection with energy storage capacitors and associated equipment.

Applications in writing, giving full details of qualifications, training and experience to the Works Personnel Officer, B I C C Ltd., Helsby, near Warrington, Lancs.

4545

THE SHELL PETROLEUM COMPANY LIMITED

has a vacancy for an

ELECTRICAL ENGINEER

in their

MARKETING OPERATIONS DEPARTMENT.

Candidates should be under 30 years of age and should hold a university degree or equivalent qualification in electrical engineering. It is essential to have had a number of years' practical experience of electrical industrial installation practice, and experience of small-scale electrical generation would also be an advantage.

Initially, employment would be in London, but successful candidate must be willing to serve overseas when required to do so.

The post is of a career nature with excellent prospects.

Commencing salary according to experience.

Please write in strict confidence, giving age, qualifications and experience, to :—

STAFF DEPARTMENT (R)
ST. HELEN'S COURT
GREAT ST. HELEN'S, LONDON, E.C.3

4552

CENTRAL ELECTRICITY GENERATING BOARD

Northern Project Group

APPLICATIONS are invited from suitably qualified and experienced engineers for the following appointments at High Marnham Power Station, near Retford, Notts :—

SECOND ASSISTANT ENGINEER
(Mechanical).

Responsible to the resident engineer for the supervision of the erection of mechanical plant. Salary £1,160/£1,510 (N.J.B. Schedule C, Grade 4). Vacancy No. E.1/A/R.

THIRD ASSISTANT ENGINEER
(Mechanical).

To assist in the supervision of the erection of mechanical plant. Salary £1,055/£1,265 (N.J.B. Schedule C, Grade 5). Vacancy No. E.1/B/R.

Applications, stating age, qualifications, present position and quoting vacancy number, should be sent to the Administration Officer, Central Electricity Generating Board, Northern Project Group, Agecroft Road, Pendlebury, near Manchester, before 30th August, 1958.

(Previous applications will be considered, so further application is not necessary.)

4561

Situations Vacant (continued)

SOUTH EASTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS, Sevenoaks and Reigate District.

Salary £685/£835 p.a. under N.J.B. Agreement, Class F, Grades 11 to 9, according to qualifications, experience and ability. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV. The position entails standby duties. The successful applicants will operate from District Office, Oxted, and their duties will cover any point within the district.

Applications, naming two referees, to District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 3rd September, 1958.

SENIOR SHOWROOM ASSISTANT, Kingston District.

Salary £615 × £20 to £675 under N.J.C. Grade 2 plus London weighting. Superannuable. The successful applicant will be primarily in charge of the Weybridge showroom, but may be required to work at any of the District's showrooms. Applicants should have had experience in an electricity supply showroom and be capable of advising consumers on apparatus.

Applications, naming two referees, on forms from the Kingston District Manager, SEEBOARD, 22, Claremont Road, Surbiton, Surrey, by 3rd September, 1958.

GEORGE WRAY,
Secretary. 4555

SOUTH OF SCOTLAND ELECTRICITY BOARD

Kincardine Generating Station

Maintenance Superintendent

APPLICATIONS are invited for the appointment of MAINTENANCE SUPERINTENDENT at Kincardine Generating Station. This Station is at present under construction and is situated on the Firth of Forth in Central Scotland and will consist of 3 120-MW units followed by 2 200-MW units, giving an ultimate capacity of 760 MW. The units will be coal fired with re-heat, having steam conditions of 1,500 p.s.i., 1000°F. for the 120-MW units and 2,350 p.s.i., 1050° F. for the 200-MW units.

Applicants should have had considerable experience in the maintenance of modern turbo-alternators and steam generating plant and be acquainted with modern repair techniques. Preference will be given to candidates with operational experience in a large modern power station. The successful applicant will be responsible for the repair and maintenance of all mechanical and electrical station plant, including instrumentation.

Salary, N.J.B., Class K, Grade 4, £1,435/£1,540 per annum rising, ultimately, to Class M, Grade 4, £1,685/£1,790 per annum.

Applications on the standard form quoting reference K4 should be submitted to the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, not later than 2nd September, 1958. 4556

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

Third Assistant Engineer (Construction)

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Construction) at Area Headquarters, Kilmarnock.

Applicants should be experienced in the construction of substations up to and including 33 kV and H.V. and L.V. overhead and underground mains. Preference will be given to applicants who are Graduates of the I.E.E. or who hold equivalent qualifications.

Salary in accordance with N.J.B. Agreement, Schedule A, Class J, Grade 10, £885-£930 per annum.

Forms of application may be obtained from the undersigned or any other Area Manager and should be returned to me duly completed with any additional information not later than 1st September, 1958.

G. F. MOORE,
Greenholm Street, Manager.
Kilmarnock. 4559

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

District Commercial Engineer, Ardrossan District

APPLICATIONS are invited for the appointment of DISTRICT COMMERCIAL ENGINEER in the Ardrossan District of this Area.

Applicants should preferably be Chartered Electrical Engineers or hold equivalent qualifications and have experience in the utilisation of electrical energy in industrial, commercial, domestic and agricultural premises, a knowledge of installation work and be conversant with tariffs, sales and all aspects of service to consumers.

The salary and conditions of service for this appointment will be in accordance with the National Joint Board Agreement, Schedule A, the present classification and grading being F3, salary £1,160/£1,235 per annum. The appointment will be superannuable.

The successful candidate will require to reside within a reasonable distance of the Ardrossan District Office.

Applications on the standard application form, which may be obtained from any Area Manager, should be submitted to the undersigned not later than 30th August, 1958.

G. F. MOORE,
Greenholm Street, Manager.
Kilmarnock. 4558

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

APPLICATIONS are invited for the following positions:—

GENERAL ASSISTANT ENGINEERS (S/13.1026).

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for general assistant engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include as a general rule, the operation and control, under supervision, of generating plant. A number of these vacancies are at the oil-firing stations at Marchwood, near Southampton, and Poole.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Salary: N.J.B. within scales £540–£730.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by 3rd September, 1958. 4562

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

APPLICATIONS are invited for the Area Headquarters Post in this Area of ENGINEERING DRAUGHTSMAN (Schedule D, Grade 6).

Applicants should have had sound Drawing Office training with subsequent experience in the preparation of working drawings for industrial and other buildings, as well as for minor civil engineering works, and be able to carry out site surveys.

Conditions of service will be in accordance with the National Joint Board Agreement, the salary being within the scale £595/£715 per annum. The post is superannuated.

Application forms, obtainable from the undersigned, are to be returned not later than Saturday, 30th August, 1958.

JAMES G. CURTIS,
"Woodlands," Area Manager.
St. Ninians Road,
Stirling.
12th August, 1958. 4557

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

STATION SHIFT CONTROL ENGINEER, DRAKELOW POWER STATION (Vacancy No. 131/58/ER).

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be an advantage.

Salary will be in accordance with Class J, Grade 10 (£885 - £930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

This appointment will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by 27th August, 1958. Please quote vacancy number.

DIVISIONAL CONTROLLER.
13th August, 1958. 4517

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

Garry/Moriston Generation Group: Vacancy for Group Control Engineer

GROUP CONTROL ENGINEER required for the Garry/Moriston Group Control Centre at Fort Augustus Switching Station. Duties, which will be on a shift basis, will be those normally associated with switching operations and load transfers on an extensive E.H.V. system interconnecting 132-kV lines and a number of hydro-electric stations. Applicants should have a sound technical training up to at least Higher National Certificate standard and practical experience in power station operation.

Salary Schedule A, Class F, Grade 7, £885/£15/£930 plus shift allowance. Superannuation scheme applicable. House will become available at a later date.

Applications, stating age, qualifications and experience, should be sent to Generation Engineer, Garry/Moriston Group, Auchterawe Switching Station, Fort Augustus, Inverness-shire, not later than 1st September, 1958. 4544

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable post:—

Wolverhampton and District Sub-Area

FOURTH ASSISTANT ENGINEER (Commercial) (Headquarters).

Applicants should have had experience in the preparation of schemes for heating and lighting installations in all classes of premises. The successful applicant will be required to abstract and collate technical information and to assist in advising consumers on the industrial applications of electrical equipment. Salary £790/£835 per annum (N.J.B. Grade K.13).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary. 4563

SOUTH-EAST METROPOLITAN REGIONAL HOSPITAL BOARD

APPLICATIONS are invited for the position of SENIOR ASSISTANT ENGINEER at the Board's headquarters. Salary £1,060 × £30 (5) × £35 (1) to £1,245.

Candidates must be Corporate Members of the Institution of Electrical Engineers with experience in the preparation of electrical engineering schemes, preferably but not essentially in hospitals.

Superannuable.

Applications stating age, present salary, etc., with two referees, should reach the Secretary, 11, Portland Place, London, W.1, by 6th September, 1958. 4532

TEST ENGINEERS

INTERESTING work in an expanding organisation is available for those interested in electrical testing and design, at the E.D.A. Testing House, Leatherhead, Surrey. In these modern laboratories, amid pleasant surroundings, domestic appliances, agricultural and light industrial equipment are tested for the Electricity Boards and the British Standards Institution. Canteen facilities are available and there is a pension scheme. At present vacancies exist in the following grades:—

TEST ENGINEER GRADE II. For those with previous experience in an electrical testing laboratory and who have the Higher National Certificate in Electrical Engineering or Physics. Commencing salary not less than £810 (according to age and experience) rising by £25 p.a. to £935 p.a.

TEST ENGINEER GRADE III. For those with previous experience in an electrical testing laboratory and with knowledge of the design of domestic electrical appliances. Commencing salary not less than £710 rising by £25 p.a. to £835 p.a.

Apply in writing to the Director and Secretary, British Electrical Development Association, 2, Savoy Hill, London, W.C.2, not later than 22nd September, 1958. 390

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

Area Wayleave Officer

APPLICATIONS are invited for the above-mentioned position. Applicants should be of good education and have experience of negotiating with landowners and public and other authorities to arrange wayleaves in connection with overhead transmission lines, including settlement of crop damage claims. Knowledge of timber valuation, estate management, office organisation, and submission of statutory notices, etc., is necessary.

The successful applicant must be able to drive and will be required to reside in Dundee or the immediate locality.

Salary and conditions of employment will be in accordance with N.J.C. Agreement and previous experience.

Applications should be submitted on standard forms obtainable from the undersigned, and should be returned by the 1st September, 1958.

R. B. ANDERSON, M.I.E.E.,
Area Manager.

7, Dudhope Crescent Road,
Dundee. 4499

ENGINEERING ECONOMICS

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY, Industrial Group Headquarters, requires an Engineer in the Commercial Department of its Industrial Power Branch at Risley, Warrington, Lancashire, to handle calculations relating to the economics of nuclear energy.

Applicants must be corporate members of a senior engineering institution, or possess equivalent qualifications, and be thoroughly familiar with the financial aspects of the operation of conventional power stations. Qualifications in statistics or economics would be an advantage.

Salary will be assessed within the scale £815 (at age 25) to £1,270. Contributory pension scheme.

A house or assistance towards legal expenses on house purchase may be available.

Send postcard for application form, quoting reference 2555, to Recruitment Officer, Industrial Group Headquarters, Risley, Warrington, Lancashire.

Closing date 8th September, 1958. 4521

TECHNICAL ASSISTANT

required for the Electrical Development Laboratory of the LINCOLN ELECTRIC COMPANY LIMITED.

Applicants should possess a degree or H.N.C. in electrical engineering and have experience in electrical machine design.

Contributory staff pension and non-contributory life assurance.

Applications stating age, experience and salary required should be addressed to Chief Electrical Engineer, Lincoln Electric Company Limited, Welwyn Garden City, Hertfordshire. 4547

EAST MIDLANDS ELECTRICITY BOARD

Engineering Draughtsman, Lincolnshire Sub-Area

APPLICATIONS are invited for the position of ENGINEERING DRAUGHTSMAN in the Drawing Office at the Lincolnshire Sub-Area Headquarters.

Candidates should have a good general and technical education, together with experience in plant layout for outdoor substations, particularly 33 kV; network and circuit diagrams; sag-tension calculations and mains records.

In the absence of the Senior Draughtsman the successful candidate will be required to take charge of a small drawing office.

The commencing salary will be in accordance with Grade 6, Schedule D (£595-£715 per annum) of the National Joint Board Agreement, according to experience and qualifications.

Applications, giving full particulars of age, present position, qualifications and experience, should be submitted to the Manager, Lincolnshire Sub-Area, North House, Grantham, so as to reach him within fourteen days of the issue of this advertisement. 4519

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

Mechanical and Public Lighting Section

Vacancy for Electrical Engineer, Special Grade, £750/£1,030 p.a.

APPLICANTS should be Associate Members of the Institution of Electrical Engineers or hold equivalent qualifications.

Candidates should have experience in the design, specification and supervision of contracts for electric lighting and power installation in large buildings.

The post is permanent, superannuable and subject to a medical examination.

Applications stating qualifications, age and experience, and naming two referees, should reach the undersigned by the 13th September, 1958.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Civic Centre,
Birmingham, 1. 4536

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant District Engineer (Planning), Derby District, Derby and Burton Sub-Area

APPLICATIONS are invited for the appointment of a FOURTH ASSISTANT DISTRICT ENGINEER in the Planning Section of the Derby District of the Derby and Burton Sub-Area.

Candidates should have a technical qualification equivalent to the Higher National Certificate in Electrical Engineering, and should have experience in the design and construction of both underground and overhead distribution systems up to and including 11 kV.

The salary and conditions of the appointment will be in accordance with Class G, Grade 11 of the National Joint Board Agreement (£740 × £15 to £785 per annum).

Applications, stating age, experience, qualifications, previous and present appointments, should be forwarded to the Manager, Derby and Burton Sub-Area, 36, Full Street, Derby, so as to reach him within fourteen days of the issue of this advertisement. 4520

POST OFFICE: ASSISTANT ENGINEER

20 PENSIONABLE posts for men 17½ and under 23½ on 1.3.58. Age extension for Forces service, Overseas Civil Service, and (up to 2 years) established Civil Service. Qualifications: (i) G.C.E. in English Language and 4 other subjects, including 2 at A level from Pure Mathematics, Applied Mathematics, Pure and Applied Mathematics, Physics, Chemistry; or (ii) equivalent academic qualification; or (iii) H.N.C. or Diploma in Electrical or Mechanical Engineering; or (iv) C. and G. Final Grouped Course Certificate in Telecommunications.

Selection by interview. London salary £490 at 18, 19, 20, £540 at 21, £685 at 25, rising to £1,000. Promotion prospects.

Write Civil Service Commission, Burlington Gardens, London, W.1, for application form, quoting 291/58. Closing date 11th September, 1958. 4495

BRISTOL EDUCATION COMMITTEE

College of Technology

APPLICATIONS invited for following full-time posts in Department of ELECTRICAL ENGINEERING, to take effect as soon as possible:—

1. SENIOR LECTURER with bias towards heavy current subjects.
2. LECTURER with bias towards heavy current subjects.
3. ASSISTANT LECTURER Grade B for work of Ordinary National Certificate standard.

Burnham Technical Scale salary:—

Senior Lecturer:	£1,350 × £50 to £1,550
Lecturer:	£1,200 × £30 to £1,350
Grade B:	£650 × £25 to £1,025

Increments within scales for approved industrial experience.

Details and application forms from Registrar, College of Technology, Bristol, 7. 4560

BICC

A METHODS ENGINEER is required to work with a small team engaged on method improvement in connection with thermoplastic cable manufacture. Applicants must be fully experienced in work study techniques and only men of outstanding ability will be considered.

This is an excellent opportunity for an enthusiastic young man who is not afraid of responsibility, can handle a variety of problems, and can negotiate at all levels.

A Degree or Higher National Certificate in Engineering would be an advantage, but consideration will be given to outstanding applicants with other qualifications.

Apply:—

Works Personnel Officer
BRITISH INSULATED CALLENDER'S CABLES LTD.
Helsby, nr. Warrington

4546

An opening has arisen for an

ELECTRICAL DRAUGHTSMAN

to do design work in connection with electrical installations in overseas factories of the DUNLOP GROUP. The person appointed will be employed at Fort Dunlop, Birmingham.

Applicants should be under 35 years of age, with an Ordinary National Certificate in Electrical Engineering. Experience of A.C. and D.C. motor control schemes, control gear layouts and H.T. and L.T. distribution systems is essential. The appointment is pensionable and offers a wide range of interesting work and future prospects.

Please write in confidence, giving age, experience and commencing salary expected, to the Personnel Manager (OE), Fort Dunlop, Erdington, Birmingham, 24.

4422

SALES MANAGER

WELL-known electrical accessory manufacturer with works in the North West, has a vacancy for an experienced Sales Manager. A man of proved organising ability, sales initiative and drive will receive a generous salary. Persons who hold similar positions in similar electrical industries and have a reasonable technical background should apply, in confidence, to the Managing Director, Box 4551.

TRANSFORMERS (WATFORD) LIMITED

require

EXPERIENCED SENIOR TRANSFORMER DRAUGHTSMAN.

Permanent and progressive position.

Apply:
Chief Draughtsman, Transformers (Watford) Ltd., Sandown Road, Watford.

4524

***Situations Vacant** (continued)*

INSPECTOR OF WORKS (ELECTRICAL)

required by the Government of the EASTERN REGION, NIGERIA Public Works Department on contract for one tour of 12 to 24 months in the first instance.

Salary, according to age and experience, in scale (including inducement addition) £864 rising to £1,488 a year. Gratuity at rate of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards children's passages and grant up to £150 a year towards maintenance in U.K. Liberal leave on full salary.

Candidates should be under 55 years of age and have served a regular apprenticeship with a reputable electrical engineering firm with a further five years as a journeyman. Preference given to candidates possessing City and Guilds Certificate in the appropriate trades.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/50232/EF. 4522

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

THIRD ASSISTANT ENGINEER (Construction). Applicants should possess the Higher National Certificate in Civil Engineering, and must be fitted by training and experience for the supervision of civil works on site by direct labour and to act as Clerk of Works where the work is carried out by contract.

Specialised experience in the construction of large electricity substations will be an advantage.

Salary N.J.B. Class M, Grade 10, £1,065/£25/£1,140 per annum.

Applications, quoting 3SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 5th September, 1958. 4549

LONDON ELECTRICITY BOARD

General Assistant Engineer

APPLICATIONS are invited for the above position in the Board's North Western District at Hampstead, London, N.W.3.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the electricity industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be £590 per annum rising to £725 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 1st September, 1958. Please quote ref. PER/2517/R. 4535

NORTH EASTERN ELECTRICITY BOARD

Tees Sub-Area

APPLICATIONS are invited for the appointments of (a) SENIOR DRAUGHTSMAN and (b) ENGINEERING DRAUGHTSMAN at Sub-Area Headquarters, Thornaby on Tees.

Applicants should have had experience in design of brick buildings; some knowledge of layout of electrical equipment in substations an advantage. Salaries (a), Schedule D, Grade 5, £760/£860; (b) Schedule D, Grade 6, £595/£715. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4548

ASSISTANT ELECTRICAL ENGINEER

ELECTRIC motor control gear manufacturers require young Assistant in Design Office with knowledge of electronics. Progressive position, contributory pension scheme.—Box 4496.

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the Protective Gear Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 8, commencing in range £710-£835, ultimately rising to £935 per annum.

A university degree, Higher National Certificate, or equivalent qualification is desirable. Some knowledge of protective gear is required, and preferably experience with a switchgear manufacturer.

Apply, quoting Vacancy No. 851MD, on form AE6, available from the Establishments Officer, Central Electricity Generating Board, 53, Wake Green Road, Moseley, Birmingham, 13, by 4th September, 1958. 4516

TECHNICAL SALES ENGINEERS

required for expanding company North East Coast and Scotland. Medium-voltage switchgear and substation equipment. Experience essential. State age, experience and salary required to—Box 4523.

A LEADING marketing organisation has a vacancy for an experienced representative to assist with field investigations in the wholesale and retail trade. Willingness to travel throughout Britain is essential. Experience of electrical and hardware trades an advantage. Excellent prospects for executive development. —Box 4528.

ASSISTANT electrical engineer with sound technical training and practical experience, a good knowledge of heavy electrical equipment, control schemes and cabling, required for large integrated iron and steel works in North Lincs. Age preferably not over 35. Reply giving full details of education, training and experience to the Chief Engineer, Appleby-Frodingham Steel Company, Scunthorpe, Lincs. 4564

ASSISTANT storekeeper required by electrical wholesalers. Preferably experienced in dealing with installation supplies. Good prospects. Apply giving experience, salary, age, etc., to—Supra Elec. Co. Ltd., 26, Soho Square, London, W.1. 4539

CABLE makers (independent) require fully qualified works manager with comprehensive knowledge of electric cable making in all phases with emphasis on low tension. Possibility of employment overseas. All applications will be treated in strict confidence.—Box 4501.

CHARGEHAND and foreman electricians required for service in East Africa. Opportunity for permanency if desired. Must be experienced in all types of electrical installations. Write stating age and experience.—Box 4540.

CONTROL gear engineer required, age 23-35, for layout and circuiting of contactor equipment. Good salary. Permanent and progressive position. Canteen, pension scheme. Write stating age, experience and qualifications, if any, to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 273

CROMPTON PARKINSON Ltd. require contract engineer familiar with 33 kV and 66 kV outdoor switchgear layout, capable of preparing or supervising preparation of substation layout drawings, of specifying steelwork and ancillary equipment, also technically qualified to prepare tenders and process orders for complete outdoor switching stations. Location, Chelmsford. Superannuation scheme. Write stating age, full details previous experience and salary required to Contract Dept., Chelmsford. Ref. 1Co. 4488

DESIGN development. Senior engineer required by well-known manufacturer of rotating electrical machines. A vacancy with opportunity for a man with ability and experience in the field of electrical engineering design. Submit experience, age, etc., to—Box 4565.

DESIGN engineer with H.N.C. required for interesting and varied work on power transformers and voltage regulating devices. Company expects to pay not less than £950 p.a. Modern factory 30 miles from London. Housing available. Superannuation scheme. Apply in confidence giving academic qualifications and career to date.—Box 4449.

DRAUGHTSMEN required for switchgear division. Congenial conditions. Canteen facilities. Apply Secretary, Lancashire Dynamo Nevelin Limited, Hurst Green, Oxted, Surrey (Telephone, Oxted 3361). 4502

DRAKE & GORHAM (CONTRACTORS) Ltd. have a vacancy for a supervising engineer to assist the manager at their Cardiff office. Applicants should write stating age, details of experience and salary expected to—36, Grosvenor Gardens, London, S.W.1. 4458

DRAUGHTSMAN required for development and contract work in connection with H.V. overhead line switchgear and interrupter devices. Excellent working conditions. Good prospects. Superannuation scheme. Write giving details of experience to—Hackbridge & Hewittic Electric Co. Ltd., Walton-on-Thames, Surrey. 4440

EKCO-ENSIGN ELECTRIC Ltd. require experienced lighting engineer at their Birmingham office. He should be thoroughly conversant with modern lighting practice and equipment. Apply—Senior Lighting Engineer, 45, Essex Street, Strand, London, W.C.2. 388

ELECTRICAL contracting foreman required by progressive company (London). Age 30 years or over. Must have served an apprenticeship and be experienced in all classes of commercial and industrial installations and able to control labour. Applications to be made in own handwriting, stating experience, age and salary required.—Box 4503.

ELECTRICAL draughtsman for switchboard layouts, etc. Permanent position. Salary by agreement. Please write—Chief Draughtsman, Astral Switchgear Ltd., Alma Rd., Enfield, Middx. 4385

ELECTRICAL engineer, preferably graduate, 25/30, required for technical work in connection with tenders for generating plant, switchgear and control boards. Must be able to prepare circuit diagrams relating to automatic control of engine-driven generating plant. This is an interesting technical appointment offering ample scope for ingenuity and original approach whilst providing an excellent opportunity for advancement with an expanding and progressive organisation situated in the South of England. Write quoting previous experience, technical training, age and salary required to Managing Director.—Box 4568.

ELECTRICAL engineer required for work on design and development of precision servo motors and associated components. Previous experience in this field desirable. Higher National Certificate or equivalent qualifications essential. Salary according to age and experience. Write, giving full details, to—Naval Manager, Evershed & Vignoles Ltd., Acton Lane Works, Chiswick, London, W.4. 4504

ELECTRICAL engineering assistant required with experience of general installation works and maintenance. Pensionable. Salary up to £860 p.a. Prospect of promotion for those obtaining H.N.C. (elec.). Application form from Chief Engineer (58/76), London County Council, County Hall, London, S.E.1. (1567) 4525

ELECTRICAL wholesalers require representatives; all areas; experience in the electrical trade essential.—Universal Distributing Co. Ltd., 66/68, Great Eastern Street, London, E.C.2 (Phone, SHOreditch 8282). 4505

ELECTRO-mechanic improver required for totalisator department as assistant to chief mechanician. Apply, giving full particulars and salary required, to—Totalisator Director, Romford Stadium, London Rd., Romford, Essex. 4493

ESTIMATOR required capable of estimating for all types of diesel and petrol generating plants up to 200 kVA. Applicant must be familiar with all makes of engines and generators and able to put forward own suggestions. Attractive locality. Works situated within ½ mile of sea.—Managing Director, Dale Electric (Yorkshire) Ltd., Filey, Yorkshire. 4526

ESTIMATOR required for N.W. London firm of contractors; experienced in industrial and council installations. Apply giving age, salary required and details of experience. —Box 4374.

FLUORESCENT control gear manufacturer requires engineer with knowledge of transformer and choke production for small works employing 30, London area. Good prospects. Apply stating age, experience and salary required.—Box 9448.

INTERESTING and progressive position offered to young man able to work on his own in the sales department of an electrical engineering concern in N.W. London. Duties would include preparation of complete quotations of specialised electrical equipment and some customer liaison. Sound electrical knowledge essential. O.N.C. an advantage.—Box 4541.

GRADUATE electrical engineer. A young man is required for post of unusual opportunity with a manufacturer of electrical equipment. Applicants should preferably have both manufacturing and design experience. Character and enthusiasm are essential. Give fullest details to—Box 4566.

KEEN young draughtsman with machine shop training required for small production drawing office of company engaged in the manufacture of control gear equipment. Electro-mechanical experience desirable but not essential. Permanent and progressive position. 5-day week, pension scheme, canteen, etc. Apply giving full details of age and previous experience to Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middx. 278

LIGHTING engineer required for sale of "Thorlux" industrial lighting equipment for the London area. Previous sales experience with connection essential. Contributory pension scheme and car provided. Write stating age and salary required. All applications treated in strict confidence.—F. W. Thorpe Ltd., Welby Road, Hall Green, Birmingham. 4567

MOTOR control and contactor gear manufacturer in Midlands requires capable and experienced designer in M.V. range. Excellent opportunity for right man. State qualifications, salary and experience, in confidence, to—Box 4497.

ONE assistant mechanical and electrical engineer required for plant operation and maintenance on Nauru or Ocean Island, Central Pacific. Salary £975 p.a. Australian currency plus qualification and child allowance where applicable. Free housing, partly furnished, and free board or allowance in lieu thereof. No income tax payable. Qualifications—under 30 years of age; standard required up to G.I. Mech.E. or equivalent. Term of service 3½ years with intermediate leave after 21 months. Apply the British Phosphate Commissioners, 2, Grosvenor Gardens, London, S.W.1, enclosing full particulars of experience and education. 4425

PILKINGTON BROTHERS Limited have vacancies for furnace design draughtsmen. Experience in the design of glass furnaces is an advantage but is not essential. Salaries are assessed in accordance with age, qualifications and experience and will be reviewed annually. Contributory superannuation and widows' pension fund are in operation and there are excellent canteen, welfare and recreational facilities. Apply, stating age, qualifications and experience to the Group Chief Engineer, Pilkington Brothers Limited, St. Helens, Lancashire. 4438

PRODUCTION process engineer required by progressive company in the London S.W. district handling electrical equipment up to 3,000 kVA. Applicants should be aged 25/35 and have served a fully indentured apprenticeship in electrical engineering with practical experience in the manufacture of either power transformers, capacitors or cables. Preference will be given to candidates who possess technical qualifications up to O.N.C. standard. The position offers considerable scope for a person with initiative, has excellent prospects, and includes a contributory superannuation scheme after fulfilling the necessary qualifying period. Write, giving particulars of experience, age and salary expected, to—Box 4542.

ROYAL NAVAL SCIENTIFIC SERVICE requires senior scientific officers and scientific officers for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for physicists, electronic engineers and mathematicians in areas specified. The following particular vacancies also exist: mechanical engineer for work on gas turbine problems in the London area; mechanical engineer for work on design and development of u/w devices in Portland area; metallurgists for Rosyth and Poole; chemists (physical and inorganic) for Poole area, Baldock and London. Candidates must normally be natural-born British subjects of natural-born British parents, with at least first or second class honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age. Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between the ages of 21 and 32 to compete for established posts. Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 4257

SALES engineer required for service in Nigeria. Applicant must be under age 35 and must hold good degree electrical or mechanical engineering and/or be A.M.I.E.E. or A.M.I. Mech.E. He will have to handle a range of equipment comprising cable, switchgear, diesel engines, pumps, compressors, etc., and must also be capable of supervising installation and servicing. Excellent prospects exist in rapidly expanding field. Duties will involve contact senior Government officials, consultants, architects, contractors, etc. Salary commensurate with age, qualifications and experience. Sea/air passage, free furnished quarters, full pay on leave after approximately 18-month tours, pension scheme. Reply stating age, domestic status and full particulars qualifications and experience, quoting ref. S.E.—Box 4569.

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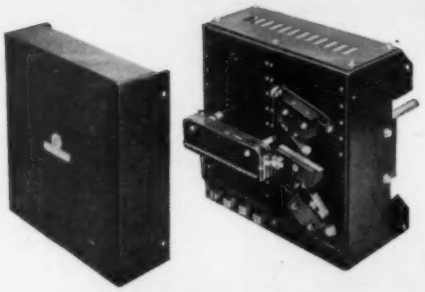

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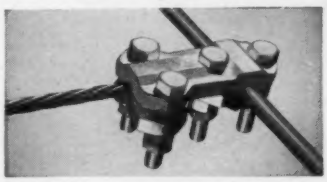

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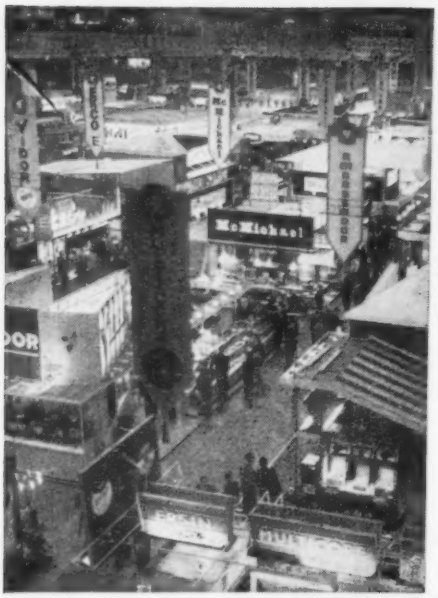

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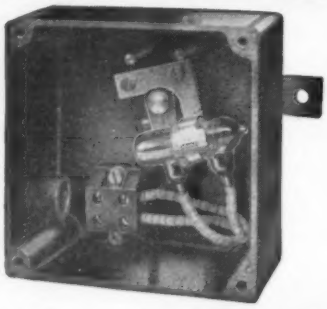

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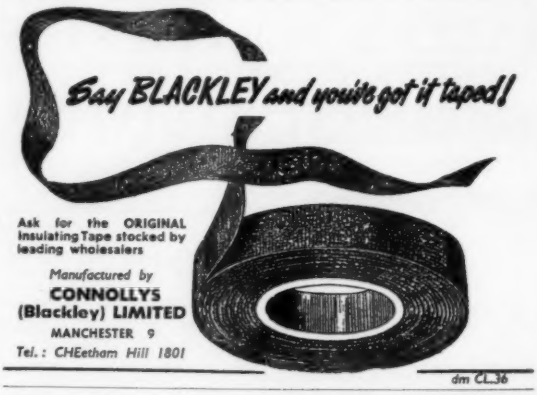

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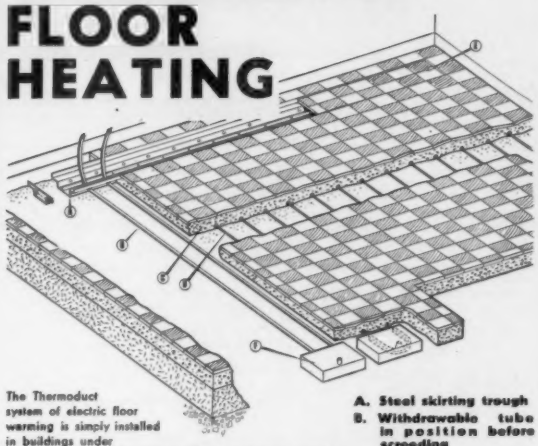

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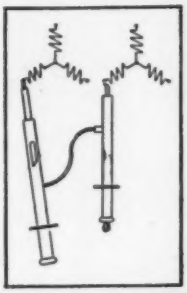

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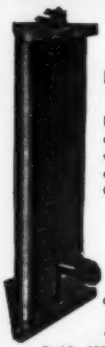

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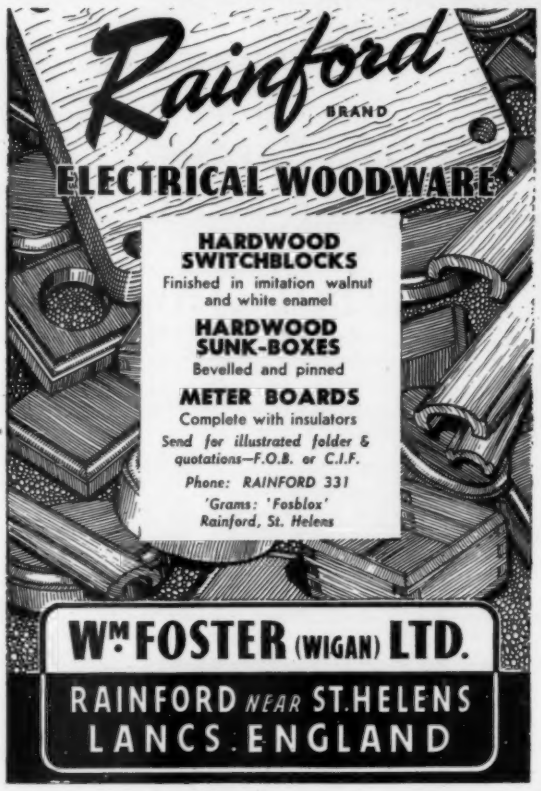

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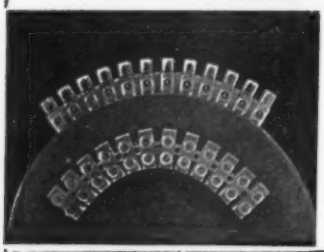

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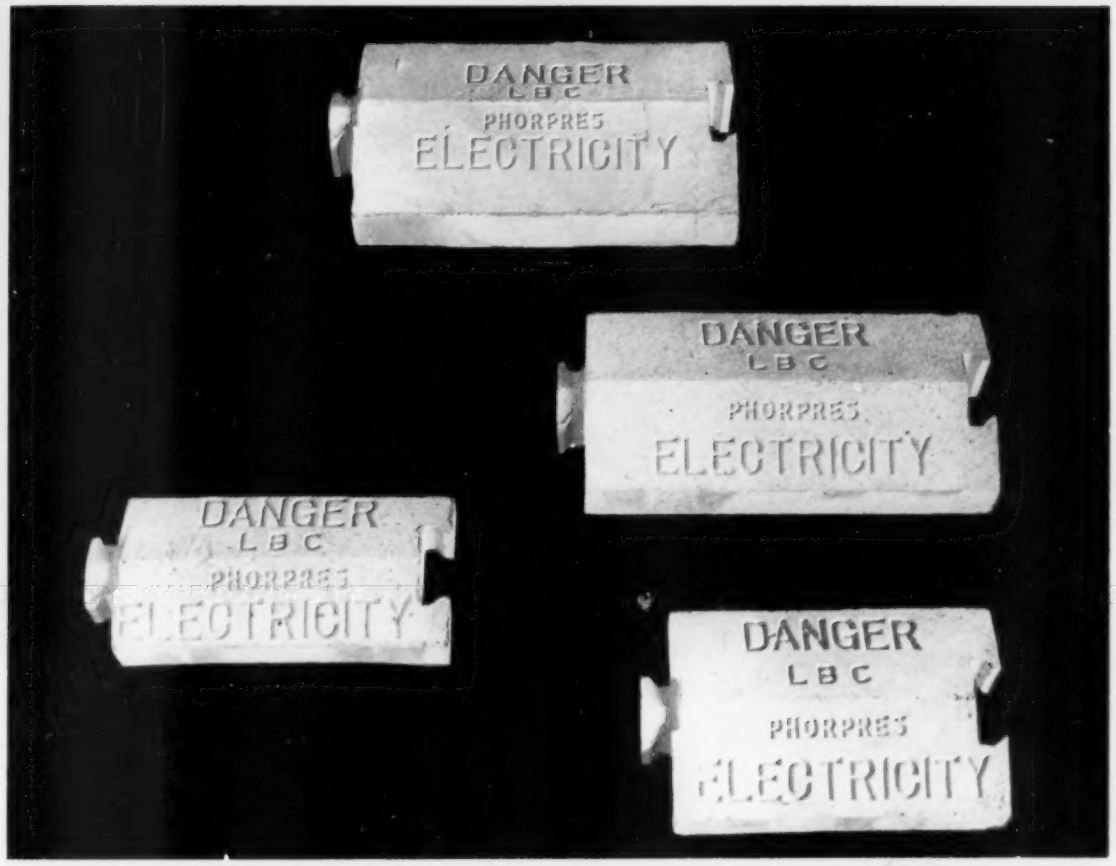

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